GAO Sites Questionnaire

Site Name HEW Site	Agency FDEP
County <u>Dade</u>	Office Southeast District
Case Manager None	Completed by Jay Koch 8/2/00
1. What is the remedial status of the site (i.e. CAP, CAR, I SE District office had no inform	RAP)? nation about this site Paul Wierzbicki ph. (561) 681-6600
2. The most recent PAST report was completed on 6/24 conducted since that date? Unknown. Site is not being to	
3. Has a Consent Order been signed? Site is not being tracked.	
If yes, is the Consent Order adequate for its purpose? N/A	10079029
If yes, is the PRP complying with the Consent Order?	
If no, is the PRP performing a "voluntary cleanup"?	

N/A

If so, is there a formal or informal agreement with the PRP for the work being conducted? Is the work satisfactory?

N/A

4. If a Consent Order has not been negotiated, is one necessary?

N/A

5. Do you feel that additional CERCLA Site Assessment activities or NPL determination is warranted? If yes, what Priority (High or Low)?

N/A

6. Comments

SITE ASSESSMENT DECISION - EPA REGION __

11 / /		
	County or Parish: Mante	
	Si: Other (report type & date): 5	P 10/13/92
ort developed by: <u>BVWST</u>		
ECISION:		
1. Further Action under Superfund (CERCLA) is not appropriate or required because:	
14 1a. Site Evaluation Accomp	olished (SEA). 1b. Action Deferred to	o: RCRA NRC
2. Further Investigation Needed Und	der Superfund: 2a. Priority: Higher Low	rer
2b. Activity PA Type: SI	ESI evaluate HRS score	
Other:		
DIEG UNDI	er pileo -253 acres	
· Release to grand	lunter, no release to	neorby
	Ciatokes	
· No surface water	707025	
	TAROACS	
· No surface water · minimal targets.		
· minimal targets.	1ey Signature: Cynthia L. Gun	(14 Date: 10/13/
ort Reviewed Approved by: Cynthio Gu		

Final Site Inspection Prioritization



SEP 2 9 1992

EPA ID № FLD043055151 WasteLan No. 00634

EPA Work Assignment № 12

Prepared under Contract № 68-W9-0055

September 23, 1992

Prepared by

B&V WASTE SCIENCE AND TECHNOLOGY CORP.

Project № 52012.065

Prepared By

Reviewed By

Approved By

Bob Gregor

Site Manager

Scotti Thomas

Technical Reviewer

Hubert Wieland

Project Manager

Final Site Inspection Prioritization

For

Amax Phosphate Facility
Palmetto, Manatee County, Florida

EPA ID № FLD043055151 WasteLan No. 00634

SEP 2 9 1992

EPA Work Assignment № 12

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DATE REPORT ACCEPTED

O MOITIZOGZIA

SAM SIGNATURE_

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Surface Water Samples

Surface Water Samples

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Figure 2 - Site Layout Map	

Final SITE INSPECTION PRIORITIZATION AMAX PHOSPHATE FACILITY

Palmetto, Manatee County, Florida
EPA ID No. FLD043055151
WasteLAN No. 00634

1.0 Introduction

B&V Waste Science and Technology Corp. was tasked by the United States Environmental Protection Agency (EPA) to conduct a Site Inspection Prioritization (SIP) for the AMAX Phosphate Facility located six miles north of Palmetto in Manatee County, Florida. This study was performed under the authorization of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) and the Superfund Amendment and Reauthorization Act of 1986 (SARA).

A Site Inspection was conducted at the AMAX site by Halliburton NUS Environmental Corporation in October, 1990 (Ref. 1). Additional sources of information used in this evaluation were EPA file material as well as documentation generated via telephone contacts and letters from previous studies. The SIP will quantify threats posed by the site and provide sufficient documentation in order for decisions to be made about a future course of action.

2.0 Site Description, Operational History and Waste Characteristics

2.1 Location

The AMAX Phosphate Facility Piney Point Complex site is located east of State Highway 45/US Highway 41 and north of Buckeye Road, six miles north of Palmetto, in Manatee County, Florida. The geographic coordinates of the site are latitude

jv-ao September 23, 1992 A:Vuly92\SH\FIT\AMAX.SIP 27°37'24" north, and longitude 82°31'54" west (Ref. 2). The site is at an elevation of between 8 and 35 feet above mean sea level (amsl) based on the National Geodetic Vertical Datum of 1929 (Ref. 2). The site location is shown as Figure 1.

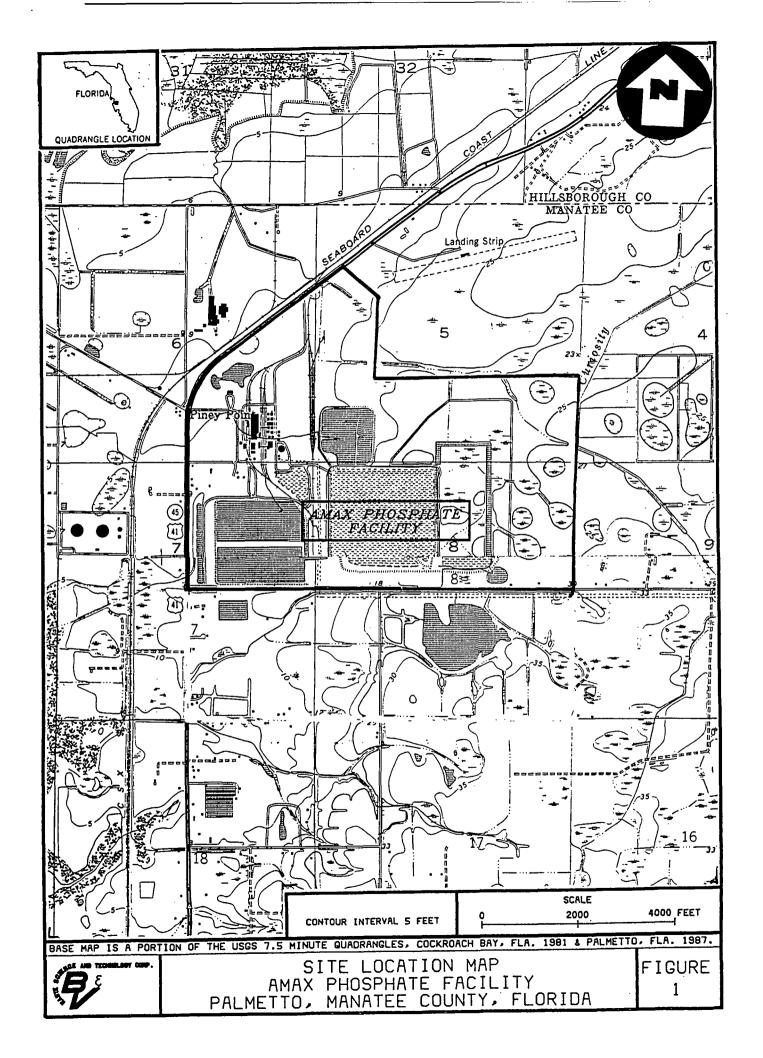
The climate in Manatee County is humid and subtropical, characterized by high mean annual rainfall and temperature. Average monthly temperatures range from 61°F in January to 82°F in July and August (Ref. 3, p. 11) with an average annual temperature of 72°F (Ref. 3, p. 105). The season with the highest rainfall extends from June through September while the remaining months of the year receive lesser amounts (Ref. 3, p. 11). The mean annual precipitation in the area is 56 inches, with a mean annual lake pan evaporation of 52 inches, yielding a net annual precipitation of 4 inches (Ref. 4). The 2-year, 24-hour rainfall is 5 inches (Ref. 5).

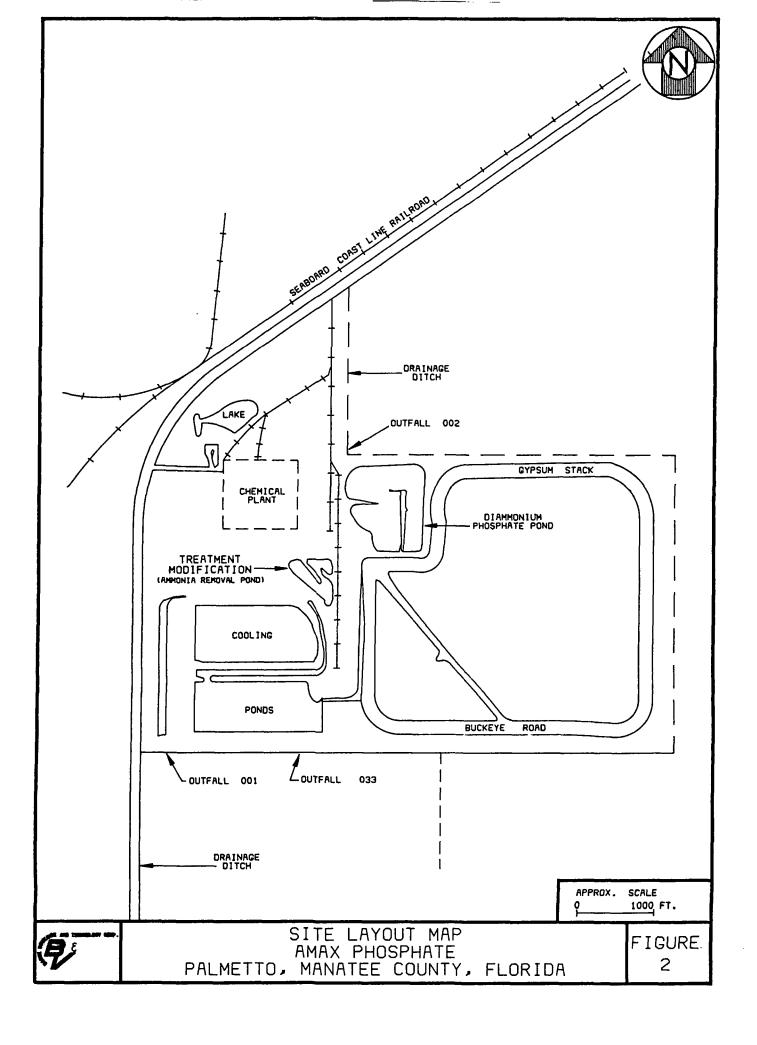
2.2 Site Description

The AMAX Phosphate Facility is located on approximately 670 acres and is a manufacturing facility which converts phosphate ore to phosphoric acid and diammonium phosphate (DAP). The facility also includes sulfuric acid, phosphoric acid, and ammoniated fertilizer plants along with a gypsum stack/cooling pond complex.

The AMAX Phosphate Facility is bordered on the west by US Highway 41, on the south by Buckeye Road and a citrus grove, on the east by farmland, and on the north by Manatee Airport, a landing strip (Ref. 2). The plant is fenced on the northern, eastern, and western borders with a guardhouse to the north. Access can be gained by foot on Buckeye Road at the southern border. During the site investigation, stressed vegetation was noted along the plant's borders (Ref. 1). A drainage ditch for nonprocess water on the northern border empties into Piney Point Creek and then into Tampa Bay approximately two miles west of the facility, while a drainage ditch along the southern border empties into Bishop Harbor one mile to the west, which also converges with the bay (Ref. 1). The site layout is shown as Figure 2.

The AMAX complex consists of several parts associated with the manufacturing process. An approximately five acre manufacturing portion, located to the northwest,





consists of sulfuric acid, phosphoric acid, and DAP plants. The largest portion of the property is used for gypsum stacks, the calcium sulfate by-product from the phosphoric acid process, which occupy approximately 253 acres on the southeast. The stacks are surrounded by a drainage ditch that channels water from the stacks back to the plant and also inhibits lateral migration of leachate from the gypsum. There is also a 32-acre DAP pond in the northwest corner of the gypsum stack area, while a 77-acre cooling pond is located in the southwest corner. Additionally, there is a 1-acre ammonia removal pond northeast of the cooling pond. Process and nonprocess water, along with gypsum, are pumped to waste disposal areas on the facility, and a network of drainage ditches ultimately leads to the two ditches mentioned above. Railroad tracks, with a spur going into the plant on the northern border of the property, are located along the western border (Ref. 1).

2.3 Operational History and Waste Characteristics

AMAX began operations at the facility in 1966 and expanded in 1978 (Ref. 6, p. 7). The facility was then sold to Consolidated Minerals, Inc. of Plant City, Florida, at an unknown date, some time after February, 1987 (Refs. 6, 7). At the end of 1988, Royster Phosphates, Inc. purchased the facility from Consolidated (Ref. 8). In November 1990, Royster sold the plant to Atlantic Fertilizer Company as a joint venture with Gulf Atlantic. Royster Phosphates, however, is still responsible for the management of the facility (Ref. 9, p. 5). The site is currently active.

The main products which AMAX produces and sells are phosphoric acid and the fertilizer, DAP. To make these products, the plant first manufactures sulfuric acid which is used to digest the phosphate ore. The phosphoric acid, produced in the process, is then reacted with ammonia to yield the final product, DAP. AMAX manufactures 2,000 tons of sulfuric acid per day and purchases an additional 300 tons per day. In the manufacturing process, brink mist eliminators in towers remove escaping acid mist and sulfur oxide before they are released into the environment (Ref. 1).

Phosphate rock is crushed and slurried with sulfuric acid. The resulting slurry is filtered to remove the phosphoric acid, which is formed in the process, from the

complex. The acid formed in this process is concentrated to 54 percent. Impurities are removed and shipped out of the plant in tanks. The process water from this production, with a pH of between 1.8 and 2.0, is used to transport the gypsum to the top of the stack and is recirculated to the plant. Exhaust from the production is washed with recycled water to remove harmful gases before discharge from the stack (Refs. 1, 9, 10).

In the production of DAP 18-46-0, anhydrous ammonia, phosphoric acid, and 75 percent phosphate rock are mixed together. The resulting slurry is pumped to a solid-materials handling system where the aqueous portion is removed, and the DAP is dried. Scrubbers inhibit dust and fumes from being released into the atmosphere. The final product is either used directly as fertilizer, or is processed further by other fertilizer plants (Refs. 1, 9, 10).

In the above mentioned processes, water that has come into contact with either gaseous emissions, dust, or gypsum is contaminated and cannot be released by the plant; therefore, excess water is kept in holding ponds. In order to minimize the volume of water, there is an evaporation system consisting of sprayers in the holding areas. During the rainy season when accumulation is increased, water is treated before it is released from the site. Before releasing the water, fluorides and phosphorous products are removed as solids and deposited on the gypsum stacks, and the acidic pH is neutralized with lime (Refs. 1, 9, 10).

The potential for pollution of air and water is inherent in the production of fertilizers. The impurities resulting from these manufacturing processes can inadvertently be released into the environment through several pathways and consist of a variety of substances. The plant process water characteristically has a low pH and contains a high concentration of inorganic by-products from the phosphate rock. In addition to elevated levels of radioactive particle emissions (uranium-238, radium-226), there may also be elevated concentrations of arsenic, cadmium, chromium, lead, fluoride, manganese, iron, and sulfate. A study conducted by the US Environmental Protection Agency (EPA) indicated that only radium-226, uranium-238, chromium, and arsenic were present at over one-half of the study sites in large enough quantities in phosphogypsum to exceed health-based screening limits (Ref. 11, p. 12-6, 12-7). Leachate from the plant, however, typically has a higher concentration of

contaminants of concern. It was found that the following concentration of metals in leachate at the study sites provided a potential health or environmental risk if released into either groundwater or surface water: arsenic, lead, cadmium, chromium, fluoride, zinc, antimony, copper, thallium, nickel, iron, and mercury (Ref. 11, p. 12-9).

Unless the gypsum stacks and cooling ponds are underlain with an impervious liner, contaminants can be discharged to groundwater; however, the soils under the stacks can neutralize or buffer the pH, causing some contaminants to precipitate from solution, thus attenuating their migration (Refs. 6, p. 8; 12, p. 7). Also, phosphates, when released into the environment, increase algal growth in surface water which upsets the natural biological balance (Ref. 13, p. 471). Because of the low pH of the process water, some of the fluorides are converted to gaseous hydrogen fluoride and transmitted into the environment during the sprinkling involved with the evaporation process on the gypsum stacks. Fluorides have been periodically found in citrus tree foliage and grass used for cattle grazing in the area around AMAX phosphate (Ref. 9). Additionally, escaping dust and fumes from the plant's stacks can transmit airborne particulate pollutants and by-products.

The plant has been permitted by the Florida Department of Environmental Regulation (FDER) to discharge process water and nonprocess wastewater into two drainage ditches. Outfalls 001 and 003, to the south of the facility, flow into a drainage ditch which empties into Bishop Harbor, an outlet to Tampa Bay, while Outfall 002, to the north, drains into a ditch which discharges into Piney Point Creek, then into Tampa Bay. Outfalls 001 and 002 are for nonprocess water, while Outfall 003 is for treated process water. Outfall 001 was used for the last time in September 1989, and Outfall 003 was last used in March 1989. Outfall 002 is still being used. All three outfalls are still permitted (Refs. 9, 14, 15).

The U.S. Geological Survey conducted a study in 1982 on the effect of groundwater contamination in the area of the gypsum stacks. Arsenic, cadmium, chromium, fluoride, lead, selenium and silver were present in excess of primary drinking water standards at AMAX (Ref. 6). A groundwater monitoring plan was submitted to the FDER in September 1983, issued in September 1985, and withdrawn in October 1985. The company collected and submitted more information, and a second permit was issued in March 1987. During this monitoring program, elevated levels of

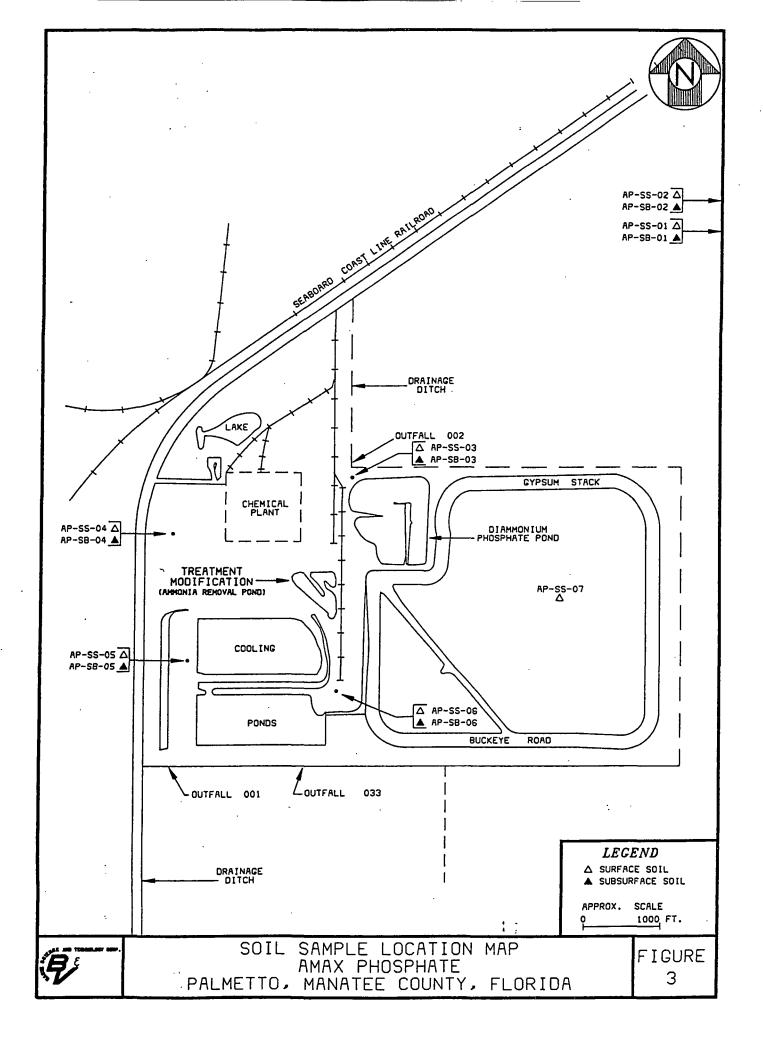
sodium, sulfate, total dissolved solids (TDS), manganese, and iron were recorded (Ref. 6).

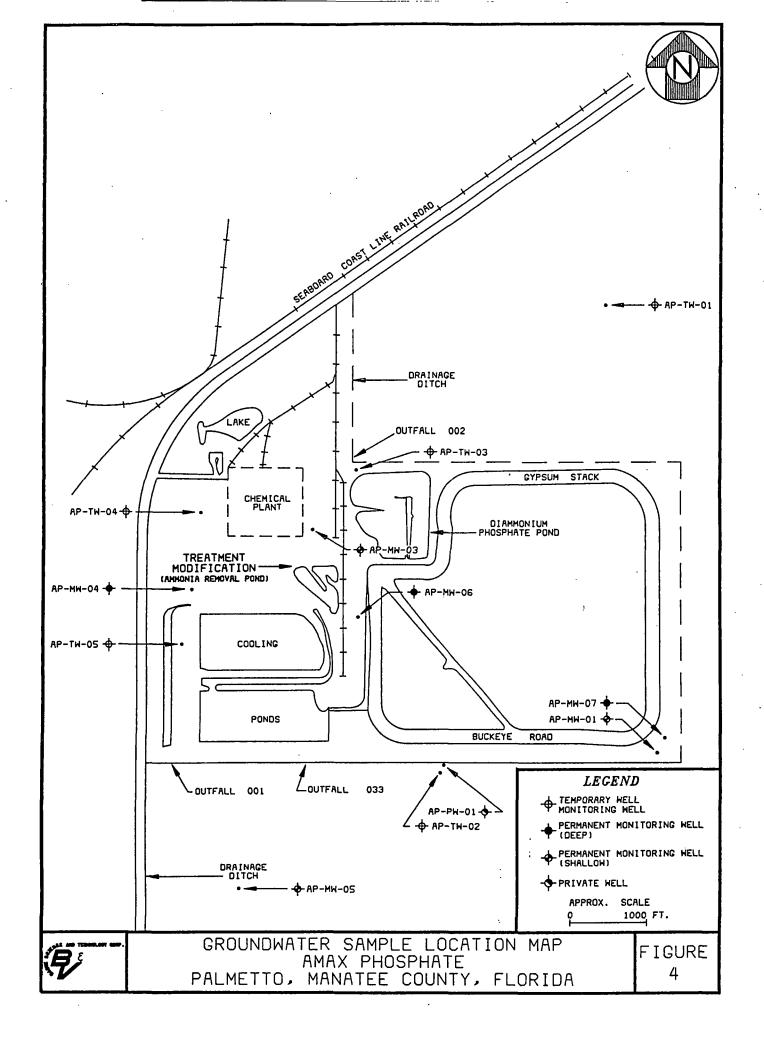
In October 1990, the Halliburton NUS Environmental Corporation Field Investigation Team (FIT) conducted a field investigation at the AMAX facility. During the sampling investigation, a total of 44 environmental samples were collected. Six surface soil, one gypsum stack, six subsurface soil, nine surface water, eleven sediment, five groundwater from temporary wells, five groundwater from existing monitoring wells and one groundwater sample from a private well were taken. Two sets of surface soil, subsurface soil, and groundwater samples, one located to the north of AMAX, the other to the east, served to establish background conditions. See Figures 3, 4 and 5 and Tables 1, 2 and 3 for sample locations.

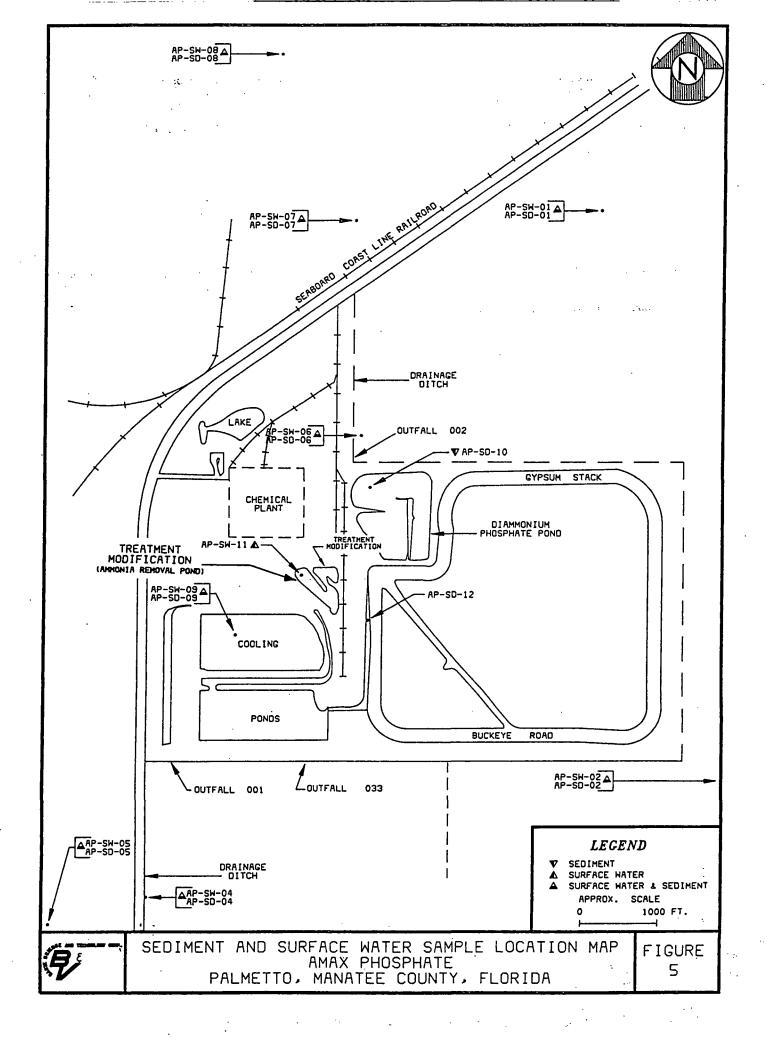
Surface soil analytical results indicated the presence of numerous metals. Sample AP-SS-03 contained cadmium (2.6 mg/kg, 3 times MQL) and nickel (5.6 mg/kg, 3 times MQL). Sample AP-SS-05 contained barium (55 mg/kg, 5 times background), cadmium (4.4 mg/kg, 5 times MQL), chromium (29 mg/kg, 4 times background), manganese (95 mg/kg, 4 times background), and nickel (9 mg/kg, 5 times MQL). Sample AP-SS-06 contained barium (33 mg/kg, 3 times background), cadmium (3 mg/kg, 3 times MQL), chromium (42 mg/kg, 6 times background), and nickel (3.5 mg/kg, 2 times MQL). Selenium was found in sample AP-SS-04 (estimated 4.9 mg/kg, 9 times MQL). Nickel was also found in the gypsum sample, AP-SS-07 (3.9 mg/kg, 2 times MQL). No organic contaminants of concern were found in surface soil samples, and no contaminants of concern were found in the subsurface soil samples collected at this site. Soil sample analytical results are presented in Tables 4 and 5.

Metals found in elevated levels in groundwater sample AP-MW-01 included cadmium (18 ug/L, 6 times MQL) and manganese (220 ug/L, 3 times background). Analytical results for groundwater samples are presented in Tables 6 and 7.

Sediment samples taken from the cooling pond and the drainage ditch adjacent to the gypsum stacks both contained elevated levels of metals. Sample AP-SD-09, taken from the cooling pond, contained chromium (140 mg/kg, 7 times background) and lead (estimated 85 mg/kg, 5 times background). Sample AP-SD-12, taken from the







Sample Codes, Descriptions, Locations, and Rationale Surface and Subsurface Soil Samples AMAX PHOSPHATE FACILITY

Palmetto,	Manatee	County,	Florida
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SAMPLE	DESCRIPTION	LOCATION	RATIONALE
AP-SS-01	Surface Soil	West side of manatee Airport Road, 2,000 feet north of AMAX	Establish background conditions
AP-SS-02	Surface Soil	East of gypsum stacks 50 feet from AMAX	Establish background conditions
AP-SS-03	Surface Soil	West side of DAP pond, between drainage ditch and pond	Determine migration of contami- nants
AP-SS-04	Surface Soil	Southwest corner of chemical plant, west of fence	Determine migration of contami- nants
AP-SS-05	Surface Soil	West of cooling pond between drainage ditch and rainwater pond.	Determine migration of contami- nants
AP-SS-06	Surface Soil	Between drainage ditch and cooling pond	Determine migration of contami- nants
AP-SS-07	Gypsum Stack	Gypsum stacks	Characterize contaminants
AP-SB-01	Subsurface Soil	In conjunction with AP-SS-01, collected 4' bls	Establish background conditions
AP-SB-02	Subsurface Soil	In conjunction with AP-SS-02, collected 4' bls	Establish background conditions
AP-SB-03	Subsurface Soil	West DAP pond and drainage ditch, collected 8' bls	Determine migration of contami- nants
AP-SB-04	Subsurface Soil	In conjunction with AP-SS-04, collected 4'	Determine migration of contami- nants
AP-SB-05	Subsurface Soil	In conjunction with AP-SS-05, collected 10' bls	Determine migration of contami- nants
AP-SB-06	Subsurface Soil	In conjunction with AP-SS-06, collected 4'bls	Determine migration of contami- nants

Source: Ref. 1

Sample Codes:

AP AMAX Phosphate Facility

SS Surface Soil SB Subsurface Soil

Sample Codes, Descriptions, Locations, and Rationale

Groundwater Samples AMAX PHOSPHATE FACILITY

Palmetto, Manatee County, Florida

SAMPLE CODE	DESCRIPTION	LOCATION	RATIONALE
AP-TW-01	Groundwater	In conjunction with AP-SS-O1, collected 7' bls	Establish background conditions
AP-TW-02	Groundwater	In conjunction with AP-SS-02, collected 4' bls	Establish background conditions
AP-TW-03	Groundwater	In conjunction with AP-SS-03, collected 10' bls	Determine migration of contami- nants
AP-TW-04	Groundwater	In conjunction with AP-SS-04, collected 4' bls	Determine migration of contaminants
AP-TW-05	Groundwater	In conjunction with AP-SS-05, collected 10' bls	Determine migration of contaminants
AP-MW- 01	Groundwater	Southeast corner of plant, surficial aquifer, 15.2' bls	Determine migration of contami- nants
AP-MW- 03	Groundwater	East of chemical plant, surficial aquifer, 21.2' bls	Determine migration of contaminants
AP-MW- 04	Groundwater	North of cooling ponds, surficial aquifer, 22.6' bls	Determine migration of contaminants
AP-MW- 05	Groundwater	South of Buckeye Road, surficial aquifer, 15.2' bls	Determine migration of contami- nants
AP-MW- 06	Groundwater	West of gypsum stack drainage ditch, intermediate aquifer, 65.5' bls	Determine migration of contaminants
AP-PW-01	Groundwater	West of gypsum stacks, 50 feet east of AMAX	Determine migration of contami- nants

Source: Ref. 1

Sample Codes:

AP AMAX Phosphate Facility
MW Groundwater, Monitoring Well

PW Private Well

TW Groundwater, Temporary Well
AP-MW-02 was not collected

Sample Codes, Descriptions, Locations, and Rationale **Surface Water and Sediment Samples AMAX PHOSPHATE FACILITY**

Palmetto, Manatee County, Florida

SAMPLE CODE	DESCRIPTION	LOCATION	RATIONALE
AP-SW-01	Surface Water	Little Manatee River 5 miles north of AMAX	Establish background conditions
AP-SW	Surface Water	Cabbage Slough Creek 1.5 miles east of AMAX	Establish background conditions
AP-SW-04	Surface Water	Southwest corner of AMAX in drainage ditch downgradient from Outfalls 001 and 003	Determine migration of contami- nants
AP-SW-05	Surface Water	Confluence of drainage ditch and Bishop Creek	Determine migration of contami
AP-SW-06	Surface Water	Drainage ditch downgradient from Outfall 002	Determine migration of contami
AP-SW-07	Surface Water	Drainage ditch downgradient from Outfall 002, east of Highway 41	Determine migration of contami- nants
AP-SW-08	Surface Water	Piney Point Creek, 20 feet north of County Line Road	Determine migration of contami- nants
AP-SW	Surface Water	East end of cooling pond	Characterize contaminants
AP-SW-11	Surface Water	West end of ammonia removal pond	Characterize contaminants
AP-SD-01	Sediment	In conjunction with AP-SW-01	Establish background conditions
AP-SD-02	Sediment	In conjunction with AP-SW-02	Establish background conditions
AP-SD-04	Sediment	In conjunction with AP-SW-04	Determine migration of contami
AP-SD-05	Sediment	In conjunction with AP-SW-05	Determine migration of contami
AP-SD-06	Sediment	In conjunction with AP-SW-06	Determine migration of contami
AP-SD-07	Sediment	In conjunction with AP-SW-07	Determine migration of contami
AP-SD-08	Sediment	In conjunction with AP-SW-08	Determine migration of contami
AP-SD-09	Sediment	In conjunction with AP-SW-09	Characterize contaminants
AP-SD-10	Sediment	DAP pond by waste inlet	Characterize contaminants
AP-SD-11	Sediment	In conjunction with AP-SW-11	Characterize contaminants
AP-SD-12	Sediment	Drainage ditch west of gypsum stacks	Determine migration of contami

Source: Ref. 1

Sample Codes:

AP **AMAX Phosphate Facility**

SD Sediment Surface Water PW

AP-SW-03, AP-SW-10 and AP-SD-03 were not collected

Summary of Organic Analytical Results Surface and Subsurface Soil Samples

AMAX PHOSPHATE FACILITY

PARAMETERS (ug/kg)	BACKG	ROUND	ON SITE				GYPSUM	BACKG	ROUND	ON SITE				
	AP-SS-01	AP-SS-02	AP-SS-03	AP-SS-04	AP-SS-05	AP-SS-06	AP-SS-07	AP-SB-01	AP-SB-02	AP-SB-03	AP-SB-04	AP-SB-05	AP-SB-06	
PURGEABLE COMPOUNDS											-			
Toluene	2يا	2.J	_	64	1J	1J	-	6U	6U	-	-	_	3J	
EXTRACTABLE COMPOUNDS														
Phenol	890U	720U	-	-	_	-	480J	-	-	-	-	-	_	
Oi-N-Butylphthalate	890U	720U	_	_	120J	_	-	_	-	-	-	_	_	
Unidentified Compounds/Nº(1)	8000J/5	3000J/2	8000J/6	3000J/2	5000J/4	2000J/2	1000J/1		800J/1	2000J/2			1000J/1	
Petroleum Product ⁽¹⁾		N			N					<u> </u>				
Dodecanoic Acid ⁽¹⁾	1					·	2000JN			<u> </u>				
Hexadecanoic Acid ⁽¹⁾							4000JN							
PESTICIDE\PCB COMPOUNDS														
4,4'-DDE(P,P'-DDE)	43U	39	-	<u> </u>	_	-	_	_	_	_		T -		
4,4'-DDT(P-P'-DDT)	43U	39	-	-	-	_		-	-	-	-	-		
Gamma-Chlordane	220U	45J	-	-	-	_	-	-	-	-	-	-	-	
Alpha-Chlordane	220U	52J	-	-	-	-	-	-	-	-	-	-	_	

- Material analyzed for but not detected above minimum quantitation limit (MQL).
- J Estimated value.
- N Presumptive evidence of presence of material.
- U Material was analyzed for but not detected. The number given is the MQL
- (1) Tentatively identified compound. This compound is not on Target Compound List and is reported only as detected in Individual samples; MQL not determined.
 - Shaded cells denote elevated concentrations of contaminants either three times greater than background, or greater than or equal to MQL

TABLE 5 Summary of Inorganic Analytical Results Surface and Subsurface Soil Samples AMAX PHOSPHATE FACILITY

PARAMETERS (mg/kg)	BACKG	ROUND		ON	SITE		GYPSUM	BACKG	BACKGROUND		ON SITE				
	AP-SS-01	AP-SS-02	AP-SS-03	AP-SS-04	AP-SS-05	AP-SS-06	AP-SS-07	AP-SB-01	AP-SB-02	AP-S8-03	AP-SB-04	AP-SB-05	AP-SB-06		
Aluminum	1600	200	4600	1300	6000	8300	1100	4500	1100	2900	1100	1700	3100		
Barium	11	3 U	30	13	55	33	30	20	3U	11	5.3	5.6	18		
Cadmium	0.83U	0.63U	2.5	_	4.4	3	-	0.73U	Ue3.0	-	-	-	_		
Calcium	45,000	2100	96,000	9200	190,000	88,000	150,000	1900	130U	42,000	600	6700	63,000		
Chromium	4.9	6.8	18	-	29	42	11	7.9	1.4U	6.6	-	4.1	5.2		
Cobalt	1.1U	0.84U		-	2.4	1.5	-		-	-	-	-	_		
kon	1500J	300J	5200.1	2600J	4300J	7000J	1800J	4300J	800J	2700J	460	700J	2500J		
Lead	7.1J	50J	9.5J	-	19J	25J	8.9J	4.3J	1J	1.8J	1.4J	1.3J	3.3J		
Magnesium	4500	180	220	260	1100	2700	190	240	30U	280	-	-	390		
Manganese	24	19	10		95	14	25	-	-	-	_	_			
Nickel	1.7U	1.3U	5.6	-	9	3.5	3.9	-	-	-	_		-		
Potassium	160U	30U	420	-	860	820	-	-	-	-	-		_		
Selenium	0.55UR	0.42UR	-	4,9	-	-	-	-	-	-		-	-		
Sodium	280U	30U	1800	-	2600	2900	960	60U	30U	390	-	-	540		
Vanadium	5U	1U	36	-	56	42	13	6U	1U	13	-	-	-		

- Material analyzed for but not detected above minimum quantitation limit (MQL).
- J Estimated value.
- U Material was analyzed for but not detected. The number given is the MQL
- R Quality Control indicates that data is unusable. Compound may or may not be present.
 - Shaded cells denote elevated concentrations of contaminants either three times greater than background, or greater than or equal to MQL.

Summary of Organic Analytical Results Groundwater Samples

AMAX PHOSPHATE FACILITY

Palmetto, Manatee County, Florida

PARAMETERS	BACKG	ROUND	ON SITE				PRIVATE WELL	TRIP Blank				
(nGV)	AP-TW-01	AP-TW-02	AP-TW-03	AP-TW-04	AP-TW-05	AP-MW-01	AP-MW-03	AP-MW-04	AP-MW-05	AP-MW-06	AP-PW-01	AP-PB-01
PURGEABLE COMPOUNDS												-
Carbon Disulfide	5U	5U	–	-	_		<u> </u>	14	-	130	-	-
Acetaldehyde ⁽¹⁾												6JN
EXTRACTABLE COMPOUNDS				·								
Benzoic Acid	50U	42ا	_	-	-	_	_	_	_	_	-	-
Bis (2-Ethylhexyl) Phthalate	10U	10U	-	-	-	_		76	_	_	-	
Diethylmethylbenzamide ⁽¹⁾				<u> </u>		10JN						
Butylidenebisdimethylethylmethylphenol ⁽¹⁾			 	T			20JN	20JN	10JN			
Octanoic Acid ⁽¹⁾				†		1	5JN		6JN			
Caprolactam ⁽¹⁾	1							100JN		70JN		
Unidentified Compounds/N=(1)						<u> </u>		20J/1	100J/3			
Decanoic Acid ⁽¹⁾									5JN			
Bis (Hydroxylethyl)Dodecanamide(1)									30JN			
Tetramethylbutane ⁽¹⁾					7JN							

- Material analyzed for but not detected above minimum quantitation limit (MQL).
- J Estimated value.
- N Presumptive evidence of presence of material.
- U Material was analyzed for but not detected. The number given is the MQL.
- (1) Tentatively identified compound. This compound is not on Target Compound List and is reported only as detected in individual samples; MQL not determined.
- AP-MW-02 was not collected.

Shaded cells denote elevated concentrations of contaminants either three times greater than background, or greater than or equal to MQL.

pm/SH July 17, 1982 A:\JUL82\AMAX\TABLE8

Summary of Inorganic Analytical Results

Groundwater Samples AMAX PHOSPHATE FACILITY

Palmetto, Manatee County, Florida

PARAMETERS	BACKG	ROUND	ON SITE				PRIVATE WELL	TRIP BLANK				
(ug/l)	AP-TW-01	AP-TW-02	AP-TW-03	AP-TW-04	AP-TW-05	AP-MW-01	AP-MW-03	AP-MW-04	AP-MW-05	AP-MW-06	AP-PW-01	AP-PB-01
Aluminum	36,000	260,000	7300	20,000	5600	3400	750	_	1610	_	-	-
Arsenic	14	53	18	56	-	-	30J	-	-	-	-	-
Barium	110	460	53	210	130	-	120	-	52	-	-	-
Beryllium	2U	6		-	+	-	-	-	-	-	-	-
Cadmium	3U	3U	-	-	-	-	18	-	_	-	-	-
Calcium	91,000	21,000	600,000	320,000	470,000	81,000	380,000	140,000	270,000	75,000	83,000	-
Chromium	78	190	12	38	13	-	-	-	9		-	_
Cobalt	7	32	-	9	-	_		-	-		_	-
Iron	26,000J	170,000J	27,000J	25,000J	2300J	3300J	10,000J	1300J	3200J	-	_	-
Lead	18	44	_	12	5	5	-	-	-	8	-	-
Magnesium	20,000	9300	36,000	25,000	39,000	37,000	16,000	16,000	61,000	22,000	40,000	-
Manganese	70U	70	-	39	_	73	220	-	-	-	-	-
Nickel	18	89	-	14	-	-	-	_	-	-	_	-
Potassium	29,000	2900	23,000	8000	30,000	4000	9100	2600	9300	6400	3700	-
Sodium	28,000	2200	7000	120,000	55,0000	75,000	350,000	36,000	61,000	29,000	55,000	-
Vanadium	74	170	-	-	130	-	-	-	-	-	-	-
Zinc	60UJ	130J	-	-	-	_	-	-	-	_	-	-

- Material analyzed for but not detected above minimum quantitation limit (MQL).
- J Estimated value.
- N Presumptive evidence of presence of material.
- U Material was analyzed for but not detected. The number given is the MQL.
- * AP-MW-02 was not collected.

Shaded cells denote elevated concentrations of contaminants either three times greater than background, or greater than or equal to MQL.

lead (estimated 85 mg/kg, 5 times background). Sample AP-SD-12, taken from the drainage ditch, contained barium (8 mg/kg, 4 times MQL), chromium (76 mg/kg, 4 times background), cobalt (3.4 mg/kg, above MQL), and lead (estimated 59 mg/kg, 4 times background). Cobalt was also found in sample AP-SD-11 (3.9 mg/kg, above MQL). Analytical results for sediment samples are presented in Tables 8 and 9.

Surface water sample AP-SW-09, taken from the cooling pond, contained elevated levels of the following metals: beryllium (23 ug/L, 23 times MQL), cadmium (130 ug/L, 43 times MQL), chromium (360 ug/L, 13 times background), cobalt (210 ug/L, 52 times MQL), manganese (4100 ug/L, 37 times background) nickel (690 ug/L, 86 times MQL), and zinc (estimated 1400 ug/L, 11 times MQL). Arsenic was found in sample AP-SW-11 (49 ug/L, 6 times MQL). Cyanide was found in two samples taken from the southern drainage pathway: sample AP-SW-07 contained 14 ug/L (above MQL), and sample AP-SW-08 contained 100 ug/L (10 times MQL). Surface water analytical results are presented in Tables 10 and 11.

Radium-226, radium-228, and gross alpha analyses were performed on selected soil, sediment, surface water, and groundwater samples. On-site sample AP-SS-06 contained elevated levels of radium-226 (8.12 pCi/g, 9 times background). The gypsum sample, AP-SS-07, contained radium-226 (16.5 pCi/g, 18 times background) and radium-228 (8.10 pCi/g, 14 times background). Elevated levels of radium-226 were also found along the southern drainage pathway in Sample AP-SD-12 (7.36 pCi/g, 8 times background). Surface water taken from the same location, AP-SW-12, contained radium-226 (1.85 pCi/L, 3 times background). Radionuclide analytical results are summarized in Tables 12 and 13.

3.0 Groundwater Pathway

3.1 Hydrogeologic Setting

The AMAX Phosphate Facility is located in the Gulf Lowlands subdivision of the Atlantic (Gulf) Coastal Plain physiographic province and the southeast coastal plain hydrogeologic setting in northwest Manatee County, Florida (Ref. 3, p. 105). The major soil types in the area of the facility include the Palmetto, Wabasso, Eau Gallie,

Summary of Organic Analytical Results - Sediment Samples

AMAX PHOSPHATE FACILITY

PARAMETERS	BACKGROUND			OUTHERN DRAINAGE PATHWAY		NORTHERN DRAINAGE PATHWAY			ON SITE			
(ug/kg)	AP-SD-01	AP-SD-02	AP-SD-04	AP-SD-05	AP-SD-06	AP-SD-07	AP-SD-08	AP-SD-09	AP-SD-10	AP-SD-11	AP-SD-12	
PURGEABLE COMPOUNDS												
Acetone	13U 6U	31U	_		26	-	-	37	_	_	-	
Carbon Disulfide	6U	10.1	_	- 1	-	-	-	-	-	-		
Trimethylbicycloheptane ⁽¹⁾		l . 1				30JN	j					
Methyl (Methylethyl)Benzene (1)		'		1		200JN						
Unidentified Compounds/N ^{a(1)}						_20J/1]					
EXTRACTABLE COMPOUNDS												
Phenol	840U	2100				•			10,000			
Benzoic Acid	4100U	10,000U	-	-	-	-			690J		-	
Acenaphthene	840U	2100U	-	_	-	140J	-	-	ļ - I			
Phenanthrene	580J	2100U		750J	-	760J	l –	-	-	-	-	
Anthracene	140J	2100U		_	l –	190J	–	-	-	l –	-	
Di-N-Butylphthalate	840U	2100U		_	l –	_	-	-	i -	150J	-	
Fluoranthene	1400	2100U	-		-	3200		-	-	-	_	
Pyrene	750J	2100U	_	720U	! -	1600	\	\ -	-	-	-	
Benzylbutylphthalate	840U	2100U		-	-	_	210J		-	-	-	
Benzo (A) Anthracene	330J	2100U		120J	-	490J	-		-	_	-	
Chrysene	500J	2100U	-	420J	_	710J		_	_	-	-	
Bis (2-Ethylhexyl)Phthalate	840U	2100U			-		_	_	-	-		
Benzo (B and/or K) Fluoranthene	440J	2100U	_	270.)	\ -	470J	\ <u> </u>	\ <u>-</u>	-	-	۰ -	
Benzo (A) Pyrene	380J	2100U	_	210J	_	350J	_	_	_	-	-	
Indeno (1,2,3-CD) Pyrene	220J	2100U	_	l -	-	140J			_	l –	l –	
Benzo (GHI)Perylene	210J	2100U	_	l –	i –	-	_	l –	-		-	
Unidentified Compounds/Nª	2000J/2	50,000J/15	2000J/1	3000J/3	l –	20,000J/5	20,000J/7	5000J/2	30,000J/4	50,000J/17	3000J/2	
Petroleum Product ⁽¹⁾		N	1	1		N	1	1	1	N	1	
Dodecanoic Acid ⁽¹⁾	ı	1		1				1000JN	20,000JN		ŀ	
Hexadecanoic Acid ⁽¹⁾	600JN	1000JN	1			500JN				ł	1000JN	
Anthracenedione ⁽¹⁾	300JN		1	•					ł			
Benzofluorene ⁽¹⁾	300JN	1	1	į.	İ	300JN	1	ŀ	Ì	1		
Benzofluoranthene (Not B or K)(1)	200JN	}	}	1]	1	1]]	1	1	
Benzacephenanthrylene ⁽¹⁾	500JN	i '	ĺ	1	ľ		ļ	i				
Tetrahydrodimethyl (Methyethyl) Naphthalene (1)		Į,	}	1	1	2000JN	500JN					
Naphthalenol ⁽¹⁾		ļ,	ŗ.	i	ł	1000JN				1	ł	
Heptadecanoic Acid ⁽¹⁾			Į.		Į.	13333.1	Į.	400JN	ļ		ļ.	
Octadecanoic Acid ⁽¹⁾			ł		i	Į.	1	800JN	4000JN			
Phenylethanone ⁽¹⁾		Į	1		1	1	1		3000JN		İ	
Tetradecanoic Acid ⁽¹⁾			1	1		1	İ	}	700JN	1	1	
Phenyltricyclononadienol ⁽¹⁾		1			1		1		2000JN		1	
Diphenylpropanedione(1)			\	1	1	1	1	}	6000JN	1	1	
PESTICIDE/PCB COMPOUNDS				-			*************************************	·		•		
PCB-1248(AROCLOR 1248)	200U	500U		T -		T -	350					

- Material analyzed for but not detected above minimum quantitation limit (MQL).
- J Estimated value.
- N Presumptive evidence of presence of material.
- U Material was analyzed for but not detected. The number given is the MQL.
- (1) Tentatively identified compound, this compound is not on Target Compound List and is reported only as detected in individual samples; MQL not determined.
 - AP-SD-03 was not collected.
 - Shaded cells denote elevated concentrations of contaminants either three times greater than background, or greater than or equal to MQL.

Summary of Inorganic Analytical Results Sediment Samples

AMAX PHOSPHATE FACILITY

PARAMETERS (mg/kg)	BACKG	BACKGROUND		SOUTHERN DRAINAGE PATHWAY		NORTHERN DRAINAGE PATHWAY			ON SITE			
	AP-SD-01	AP-SD-02	AP-SD-04	AP-SD-05	AP-SD-06	AP-SD-07	AP-SD-08	AP-SD-09	AP-SD-10	AP-SD-11	AP-SD-12	
Aluminum	380	10,000	530	1300	1100	1000	950	21,000	4400	300	12,000	
Barium	2U	80	19	7.5	5.2	13	13	110	72	16	64	
Cadmium	0.71U	1.9U	_	-	-	-	-	2.6	-	-	8	
Calcium	1400	38,000	2000	3100	8400	27,000	7200	200,000	210,000	220,000	110,000	
Chromium	1.4U	20	-	2.8	2.4	6.1	6.6	140	24	7.1	76	
Cobalt	0.95U	3U	-	-	-	_	-	2.7	-	8.9	3,4	
Copper	9UJ	62J	-	_	-	-	-	-	-	-	-	
kon	440J	11,000J	830J	1600J	9000J	6400J	2100J	45,000J	12,000J	390J	18,000J	
Lead	2.8J	16J	1.1J	74J	1.7J	11J	15J	85J	26J	2.1J	59J	
Magnesium	200	2500	82	1100	170	200	520	2000	510	4500	9900	
Manganese	2U	63	-	_	26	22	_	26		44	40	
Nickel	1.4U	6.7	-	-	2.3	2.7	-	-	4.2	17	7.6	
Potassium	60U	270U	-	-	-	-	_	2000	550	-	1600	
Sodium	350U	290U	-	2900	-	-	-	12000	3900	2800	6700	
Vanadium	1U	20U	-	-	-	-	-	140	24	-	130	

Material analyzed for but not detected above minimum quantitation limit (MQL).

J Estimated value.

N Presumptive evidence of presence of material.

U Material was analyzed for but not detected. The number given is the MQL

^{*} AP-SD-03 was not collected.

Shaded cells denote elevated concentrations of contaminants either three times greater than background, or greater than or equal to MQL.

Summary of Organic Analytical Results

Surface Water Samples

AMAX PHOSPHATE FACILITY

PARAMETERS (ug/1)	BACKG	BACKGROUND		NORTHERN DRAINAGE PATHWAY		IN DRAINAGE	ON SITE		
	AP-SW-01	AP-SW-02	AP-SW-04	AP-SW-05	AP-SW-06	AP-SW-07	AP-SW-08	AP-SW-09	AP-SW-11
PURGEABLE COMPOUNDS									
Carbon Disulfide	5U	5U	-	T -	5	-	-	<u> </u>	4J
Tetramethylbutane ⁽¹⁾									8JN
EXTRACTABLE COMPOUNDS									
Unidentified Compounds/N=(1)		T	T	T	100J/3	[Ţ	60J/4	[
Bromacil ⁽¹⁾		†	4JN		· · · · · · ·		4JN		
Hexadecanoic Acid ⁽¹⁾		<u> </u>						10JN	10JN
Hydroxymethoxybenzaldehyde ⁽¹⁾								5JN	
Petroleum Product ⁽¹⁾				<u> </u>				N	
Tetradecanoic Acid ⁽¹⁾		<u> </u>	<u> </u>				 	 	7JN
PESTICIDES/PCBs									
Endosulfan Sulfate	0.24	 -	-		_	_	_	 	-

- Material analyzed for but not detected above minimum quantitation limit (MQL).
- J Estimated value.
- N Presumptive evidence of presence of material.
- U Material was analyzed for but not detected. The number given is the MQL
- (1) Tentatively identified compound. This compound is not on Target Compound List and is reported only as detected in individual samples; MQL not determined.
- * AP-SW-03 and AP-SW-10 were not collected.
- Shaded cells denote elevated concentrations of contaminants either three times greater than background, or greater than or equal to MQL.

Summary of Inorganic Analytical Results

Surface Water Samples AMAX PHOSPHATE FACILITY

PARAMETERS	BACKG	BACKGROUND		DRAINAGE WAY	SOUTHER	RN DRAINAGE I	PATHWAY	ON SITE	
(ng/1)	AP-SW-01	AP-SW-02	AP-SW-04	AP-SW-05	AP-SW-06	AP-SW-07	AP-SW-08	AP-SW-09	AP-SW-11
Aluminum	340U	16,000	-	_	-	-	-	27,000	-
Arsenic	5 U	8U	-	-	-	-	-	-	49
Barium	20U	120	-	29	_	-	_	63	-
Beryliium	1U	10	_	-	-	-		23	-
Cadmium	3U	3U	_	-	-	-		130	-
Calcium	61,000	170,000	160,000	160,000	150,000	180,000	160,000	670,000	170,000
Chromium	6U	28	_	_	-	-	+	360	-
Cobalt	4U	4U		-	-	_	1	210	-
kon	350UJ	14,000J	-	_	-	-	•	29,000J	_
Lead	5	14	-		-	-	-	35	-
Magnesium	140,000	46,000	58,000	220,000	66,000	59,000	42,000	200,000	49,000
Manganese	20U	110	-	-	-	-	52	4100	-
Nickel	en en	8U		-	-	-	-	690	-
Potassium	47,000	13,000	16,000	68,000	3700	5300	6800	160,000	89,000
Sodium	1,100,000	68,000	110,000	1,500,000	42,000	100,000	69,000	1,200,000	650,000
Thallium	10UR	10UR		-	-	-	-	13J	-
Vanadium	4U	30U	-	-	-	-		820	-
Zinc	40UJ	130UJ	-		-	-	-	1400J	-
Cyanide	10U	10U	-		-	14	100	-	_

- Material analyzed for but not detected above minimum quantitation limit (MQL).
- J Estimated value.
- N Presumptive evidence of presence of material.
- U Material was analyzed for but not detected. The number given is the MQL.
- * AP-SW-03 and AP-SW-10 were not collected.
- Shaded cells denote elevated concentrations of contaminants either three times greater than background, or greater than or equal to MQL

TABLE 12 Summary of Radionuclide Concentrations Soil Samples

AMAX PHOSPHATE FACILITY Palmetto, Manatee County, Florida

PARAMETERS	BACKGROUND	ON SITE	GYPSUM	BACKGROUND	NORTHERN	SOUTHERN
(pCl/g) ⁽¹⁾	AP-SS-01	AP-SS-06	AP-SS-07	AP-SD-01	AP-SD-06	AP-SD-12
Radium-226	0.89±	8.12±	16.5±	0.36±	0.76±	7.36±
	5.00%	1.00%	1.0%	7.00%	5.00%	1.00%
Radium-228	0.56±	0.49 ±	8.10±	0.85±	0.38±	0.73±
	153%	186%	17.0%	115%	256%	128%

⁽¹⁾ Results are for dry soil.

Shaded cells denoted elevated concentrations of radiation, three times greater than background levels.

TABLE 13 Summary of Radionuclide Concentrations Water Samples

AMAX PHOSPHATE FACILITY Palmetto, Manatee County, Florida

PARAMETERS (pCVI)	BACKGROUND	MONITORI	NG WELLS	BACKGROUND	SOUTHERN DRAINAGE
	AP-TW-01	AP-MW-03	AP-MW-06	AP-SW-01	AP-SW-12
Radium-226	7.32±	16.4 ±	1.13±	0.54±	1.85±
	2.00%	1.00%	3.00%	4.00%	2.00%
Radium-228	2.43 ±	1.76±	0.53 ±	0.53±	0.29 ±
	87.5%	64.6%	81.0%	85.8%	182%
Gross Alpha	53.8 ±	44.6±	1.75±	5.04 ±	5.30±
	21.6%	42.4%	169%	235%	83.3%



Shaded cells denoted elevated concentrations of radiation, three times greater than background levels.

and Bradenton fine sands and the Chobee loamy fine sand which are slow to moderately permeable soils that are poorly drained (Ref. 16).

The facility is underlain by Miocene to Recent undifferentiated surficial sands, sandy limestone, and shells whose composition may vary laterally and vertically. These undifferentiated surficial deposits range between approximately 1 to 35 feet thick, and comprise the unconfined surficial aquifer system (Refs. 3, p. 129; 17, p. 62). The average depth to the water table in the area of the facility ranges between 4 and 10 feet below land surface (bls) (Ref. 9). The water table forms a subdued replica of the topographic surface in the area. Seasonal fluctuations of water levels in the surficial aquifer are generally less than 10 feet and are very dependent upon the availability of water (Ref. 3, p. 29). The vertical hydraulic conductivities of the surficial aquifer range from 4.2 x 10⁻¹⁰ to 4.6 x 10⁻³ centimeters/second (cm/s) (Ref. 3, p. 35).

The Miocene Hawthorne Group underlies the surficial aquifer system. The Hawthorne Group is located between 1 to 35 feet bls and ranges between 350 and 400 feet thick in the area below the AMAX facility (Refs. 3, p. 129; 17, p. 62). The Arcadia Formation and the Tampa Member of the Arcadia Formation comprise the Hawthorne Group in the area of the facility (Ref. 17, p. 62). The Arcadia Formation consists of limestone and dolostone containing varying amounts of quartz sand, clay, and phosphate grains. Sand and clay lenses are interspersed irregularly throughout the formation. The Arcadia Formation is approximately 220 feet thick in the area of the facility (Ref. 17, p. 62).

The Tampa Member of the Arcadia Formation is composed primarily of limestone with minor dolomite, sands, and clays. The Tampa Member is approximately 135 feet thick in the area of the facility. Sand and clay lenses also appear occasionally within the Tampa Member.

The Hawthorne Group acts as an upper confining unit for the underlying Floridan Aquifer System. The rocks that comprise the upper confining unit vary greatly in lithology and are complexly interbedded.

The Oligocene Suwanee Limestone underlies the Hawthorne group. The Suwanee Limestone is composed of hard, yellow to creamy, fossiliferous limestones. The upper part of the Suwanee Limestone contains thin, discontinuous chert lenses; the basal portion is interbedded with quartz sand and dolomite. The Suwanee Limestone ranges up to approximately 300 feet thick (Refs. 3, p. 28; 12, pp. B-32,B-33).

The Eocene Ocala Limestone underlies the Suwanee Limestone. The Ocala Limestone consists of the Crystal River Member, the Williston Member, and the Inglis Member. All three members consist of cream to fossiliferous limestone interbedded with chert beds. The Inglis Member of the Ocala Limestone often contains gray to brown dolomite. The Ocala Limestone ranges between 300 and 600 feet thick (Refs. 3, p. 28; 12, p. B-30).

The Eocene Avon Park Formation underlies the Ocala Limestone. The Avon Park Formation consists of brown fossiliferous limestone. The upper portion of the Avon Park Formation occasionally contains layers of carbonaceous material or peat, and the basal portion may contain evaporite lenses. The Avon Park Formation may be greater than 1,000 feet thick (Refs. 3, p. 28; 18, pp. B-25,B-27).

The Lower Eocene Oldsmar Formation underlies the Avon Park Formation. The Oldsmar Formation consists of micritic to finely pellital limestone thinly interbedded with fine to medium crystalline, vuggy dolomite. The basal portion of the formation is usually more extensively dolomitized than the upper portion and contains pore-filling gypsum deposits and thin beds of anhydride. The Oldsmar Formation and other lower Eocene carbonate rocks are approximately 1,500 feet thick (Ref. 18, p. B-28).

The Floridan Aquifer System is a vertically continuous sequence of carbonate rocks of generally high permeability that ranges from late Paleocene to early Miocene age. Less permeable carbonate rocks separate the aquifer system into the Upper and Lower Floridan aquifers (Ref. 18, p. B-45). The Upper Floridan aquifer is composed of the lower portion of the Tampa Member of the Arcadia Formation (Hawthorne Group), the Suwanee Limestone, the Ocala Limestone, and the Avon Park Formation (Ref. 18, pp. B-45, B-47). The top of the Floridan aquifer ranges from 357 to 400 feet bls in the area of the facility (Ref. 17, p. 62). The Upper Floridan

aquifer is approximately 1,250 feet thick. The base of the Upper Floridan aquifer is located at approximately -1,650 amsl. The Avon Park Formation is the deepest potable, water-bearing formation in the Upper Floridan aquifer (Ref. 3, p. 28).

3.2 Groundwater Targets

Within a four mile radius of the AMAX facility, the majority of the population in Manatee county obtain potable water from the Manatee County Water Department. The water department obtains its water from Lake Manatee which is not on the surface water migration pathway. The residents of Hillsborough County receive water from either private or community wells (Refs. 9, 19, 20, 21). A house count using topographic maps indicates that there are 312 residences within 4 miles of the site using water obtained from private wells. Assuming there are 2.51 persons per residence in Hillsborough County, there are approximately 783 persons using private wells (Refs. 2, 22). The nearest private well is located approximately 0.43 mile north of the facility (Ref. 2). The vast majority of these wells are completed in the surficial aquifer. Groundwater is also used for irrigation of farms and groves (Ref. 19).

3.3 Groundwater Conclusions

Because numerous people obtain their potable water from wells located near the site, the groundwater pathway may warrant some concern. However, the latest sampling has not shown any contamination in nearby private wells.

4.0 Surface Water Pathway

4.1 Hydrologic Setting

Surface water runoff from the facility is directed into a ditch system surrounding the waste source areas. These ditches, which accept process and nonprocess water, eventually drain into two canals, one to the north and one to the south, running parallel to Buckeye Road. Formerly, two outfalls, 001 and 003 for nonprocess and

process water respectively, emptied approximately one mile southwest into the later canal. This canal also receives drainage from the agricultural land to the west. This canal flows east under US Highway 41 for about 2,000 feet where it converges with a railroad canal. This canal enters a creek leading to Bishop Harbor one mile west of the site, and Bishop Harbor flows into Tampa Bay one mile downstream of this point. Outfall 002, currently in use, handles nonprocess water and enters a canal on the northern side of the site. This canal also flows west under US Highway 41 and into Piney Point Creek 2,500 feet from the AMAX facility. The creek converges with Tampa Bay two miles to the northwest of the facility (Ref. 1). In addition, the area surrounding the plant is composed of a large number of wetlands which may accept drainage from the site. Eventually, these wetlands drain into small creeks that either flow towards Tampa Bay to the west, or the Little Manatee River five miles to the north (Ref. 2). This river also drains into Tampa Bay. The AMAX facility is located in the 100 year floodplain (Ref. 23).

4.2 Surface Water Targets

The Manatee County Water Department obtains water from Lake Manatee, which is not on the surface water migration pathway. The remainder of the people obtain potable water from private or community wells. There are no intakes along the surface water migration pathway (Ref. 9).

As was mention in Section 4.1, the area surrounding the plant is composed of a large number of wetland areas. There are at least eight miles of wetlands frontage along the surface water pathway (Ref. 2). The federally endangered Florida manatee (Trichechus manatus) is often sighted in the Little Manatee River. A critical habitat for this species is located 6.5 miles from the plant (Ref. 11, p. 12-17). The Mississippi sandhill crane which is also a federally endangered species, uses the Tampa Bay area as a habitat. People often fish in Bishop's Creek which accepts runoff from the canal south of the AMAX facility. Bishop's Harbor is often used for recreational fishing. The Tampa Bay area supports additional recreational activities such as boating and swimming (Ref. 9).

4.3 Surface Water Conclusions

During flooding, the migration of contaminants from the site to the surface water system would be enhanced due to the site being in the 100 year floodplain and the presence of the drainage ditches located to the north and south of the facility. Bishop's Creek and Bishop's Harbor, located 0.25 mile and 1.0 mile from the site respectively, are fisheries within the 15-mile surface water pathway. The Mississippi sandhill crane, a federally endangered species, uses Tampa Bay, located about 2 miles east of the site, as habitat.

5.0 Soil Exposure and Air Pathways

5.1 Physical Conditions

The area to the west of AMAX is predominantly industrial with Port Manatee 1.5 miles to the west. There is a landing strip, Manatee Airport, directly to the north. The area immediately to the south consists of a citrus grove. To the west there is a cattle ranch and turf farm. The area surrounding the facility is also composed of a large concentration of wetlands. The AMAX facility is located on approximately 670 acres and includes sulfuric acid, phosphoric acid, and ammonia fertilizer plants as well as a gypsum stack/cooling pond complex. During the investigation by Halliburton NUS, stressed vegetation was present along the plant's borders. Large volumes of smoke were also seen emitting from the plants stacks (Ref. 24).

5.2 Soil and Air Targets

The closest neighbors to the AMAX facility are located in four trailers approximately 50 feet to the east of the gypsum stacks. The total population within a four mile radius is 3,893 with the following distribution: 69 people between 0 and 0.25 mile, 58 people between 0.25 and 0.50 mile, 200 people between 0.50 and 1 mile, 699 people between 1 and 2 miles, 221 people between 2 and 3 miles, and 2,666 people between 3 and 4 miles (Refs. 2, 22, 25). There are no schools within four miles of the facility (Refs. 2, 25). There are approximately 15 acres of wetlands onsite and another 50

acres within 0.5 mile of the site (Ref. 2). There are no recorded terrestrial federally endangered species within 4-mile radius of the site (Ref. 11).

5.3 Soil Exposure and Air Pathway Conclusions

The majority of the facility is fenced. However, the southern boundary is not fenced, and there are people living only 50 feet from the gypsum stacks. Therefore, there is some possibility for contaminants to spread.

6.0 Summary and Conclusions

The AMAX Phosphate Facility was assessed to identify potential threats posed to human health and the environment and to determine the need for additional investigation. There are approximately 783 potential groundwater users within four miles of the site; however, no contamination has been detected in samples from nearby private wells. There are also several miles of wetlands along the surface water pathway, as well as the occurrence of federally endangered species. Because there has been no observed release to the surface water pathway, these targets are only subject to potential contamination. From the information gathered in the study, no further action is recommended for the AMAX Phosphate Facility Site.

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CONFIDENTIAL Hazard Ranking System Preliminary Score AMAX PHOSPHATE FACILITY Palmetto, Manatee County, Florida

This preliminary score was calculated using the HRS rule and the November 6, 1991 Draft SI Worksheets. The groundwater, surface water, soil exposure, and air migration pathways were evaluated using data from a sampling inspection conducted by the Halliburton NUS Corporation during the Weeks of October 16, 1990. Table 4 through 13 in the Site Inspection Prioritization (SIP) report summarize the analytical results.

A hazardous waste quantity of 1,000,000 was assigned using the total area of the surface impoundments (110 acres) and the area under the gypsum piles (253 acres).

The groundwater pathway score contributes significantly to the site score. There was an observed release to groundwater, as documented by sampling of onsite monitoring wells. There was no observed contamination of nearby private wells.

The surface water pathway provides a moderate contribution to the overall score. There are no surface water intakes along this pathway, there are several miles of wetlands and federally endangered species along the pathway. There is also recreational fishing. No observed releases have been documented in this pathway, and dilution weights farther reduce the score.

Surface soil samples taken onsite document contaminated soil onsite at the AMAX Phosphate Facility. Access to most of the site is restricted, and the nearby population is low. Therefore, this pathway is of minor concern.

The air pathway is also of little concern. The nearest individual is approximately 50 feet from the gypsum stacks, and the 20 points assigned for "nearest individual" provide the greatest contribution to this score.

HRS SCORE S	UMMARY
<u>Pathway</u>	<u>Score</u>
Groundwater	38.67
Surface Water	19.14
Soil Exposure	8.67
Air	<u>13.56</u>
Overall Score	23.03

Based on the above information, no further action is recommended for this site.

Site Name:	AMAX Phosphate Facility
Location:	Palmetto, Manatee County, Florida

GROUND WATER MIGRATION PATHWAY SCORESHEET

FACTOR CATEGORIES AND FACTORS

	Likelihood of Release to an Aquifer	Maximum Value	Value Assigned	
1.	Observed Release	550	550	
2.	Potential to Release	220		
	2a. Containment	10	10	
	2b. Net Precipitation	10		
	2c. Depth to Aquifer	5	<u>3</u>	
	2d. Travel Time	35	35	
	2e. Potential to Release			
	[lines $2a \times (2b + 2c + 2d)$]	500	430	
	Likelihood of Release (higher of lines 1 and 2e)	550		550
	Waste Characteristics			
4.	Toxicity/Mobility	a	100	
5.	Hazardous Waste Quantity	a	10 ⁶	
6.	Waste Characteristics	100	<u> </u>	100
	<u>Targets</u>			
7.	Nearest Well	50	20	
8.	Population			
	8a. Level I Concentrations	b	0	
	8b. Level II Concentrations	b	0	
	8c. Potential Contamination	ь	33	
	8d. Population (lines 8a + 8b + 8c)	ь	33	
9.	Resources	5	5	
10.	Wellhead Protection Area	20	0	
11.	Targets (lines $7 + 8d + 9 + 10$)	Ъ		58
	Ground Water Migration Score for an Aquifer			
12.	Aquifer Score			
	[(lines 3 x 6 x 11)/82,500] ^c	100		
	Ground Water Migration Pathway Score			
13.	Pathway Score (Sgw), (highest value			
	from line 12 for all aquifers evaluated) ^c	100		38.67

Maximum value applies to waste characteristics category. Maximum value not applicable.

Do not round to nearest integer.

Cita	Name:	

AMAX Phosphate Facility

Location:

Palmetto, Manatee County, Florida

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORESHEET

	Factor Categories and Factors	Maximum Value	Value Assigned	
DR	INKING WATER THREAT			
<u>Lik</u>	elihood of Release			
1.	Observed Release	550	0	
2.	Potential Release by Overland Flow			
	2a. Containment	10	10	
	2b. Runoff	25	3	
	2c. Distance to Surface Water	25	20	
	2d. Potential to Release by Overland Flow			
	[lines 2a x (2b + 2c)]	500	230	
3.	Potential to Release by Flood			
	3a. Containment (Flood)	10	10	
	3b. Flood Frequency	50	25	
	3c. Potential to Release by Flood			
	(lines 3a x 3b)	500	250	
4.	Potential to Release			•
	(lines 2d + 3c, subject to a maximum of 500)	500	480	
5.	Likelihood of Release (higher of lines 1 and 4)	550		480
	Waste Characteristics			
6.	Toxicity/Presistence	a	10,000	
7.	Hazardous Waste Quantity	a	10 ⁶	
8.	Waste Characteristics	100		100
	Targets			
9.	Nearest Intake	50	0	
10.	Population			
	10a. Level I Concentrations	ь	0	
	10b. Level II Concentrations	ь	0	
	10c. Potential Contamination	ь	0	
	10d. Population (lines 10a + 10b + 10c)	b	0	
11.	Resources	5	5	
12.	Targets (lines 9 + 10d + 11)	Ъ		5
	Drinking Water Threat Score	•		
13.	Drinking Water Threat Score			
	[(lines 5 x 8 x 12)/82,500, subject to a			
	maximum of 100)	100		2.91

Site Name:	AMAX Phosphate Facility
Location:	Palmetto, Manatee County, Florida

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORESHEET (continued)

	Factor Categories and Factors	Maximum Value	Value Assigned	
HU	MAN FOOD CHAIN THREAT			
<u>Lik</u>	elihood of Release			
14.	Likelihood of Release (same value as line 5)	550		480
	Waste Characteristics			
15.	Toxicity/Persistence/Bioaccumulation	a	5 x 10 ⁸	
16.	Hazardous Waste Quantity	a 1 222	108	4000
17.	Waste Characteristics	1,000		1000
	Targets			
18.	Food Chain Individual	50	2	
19.	Population			
	19a. Level I Concentrations	Ъ	0	
	19b. Level II Concentrations	ь	0	
	19c. Potential Human Food Chain	•		
	Contamination	b	2.03	
20.	19d. Population (lines 19a + 19b + 19c) Targets (lines 18 + 19d)	ь		2.03
	Human Food Chain Threat Score			
21.	Human Food Chain Threat Score [(lines 14 x 17			
21.	x 20)/82,5000, subject to a maximum of 100)	100		11.81
EN	TRONMENTAL THREAT			
	Likelihood of Release			
22.	Likelihood of Release (same value as line 5)	550		480

Site Name:	AMAX Phosphate Facility
Location:	Palmetto, Manatee County, Florida

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORESHEET (continued)

	Factor Categories and Factors	Maximum Value	Value Assigned		
EN	VIRONMENTAL THREAT, (concluded)				
	Waste Characteristics				
23. 24. 25. 26.	Ecosystem Toxicity/Persistence/Bioaccumulation Hazardous Waste Quantity Waste Characteristics Sensitive Environments 26a. Level I Concentrations 26b. Level II Concentrations 26c. Potential Contamination 26d. Sensitive Environments (lines 26a + 26b + 26c)	a a 1,000 b b b	5 x 10 ⁸ 10 ⁶ 0 0 0.76	1000	
	<u>Targets</u>				
27.	Targets (value from line 26d)			0.76	
	Environmental Threat Score				
28.	Environmental Threat Score [(lines 22 x 25 x 27)/82,500, subject to a maximum of 60]	60		4.42	
SUR	SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORE FOR A WATERSHED				
29.	Watershed Score ^c (lines 13 + 21 + 28, subject to a miximum of 100)	100		16.23	
SUR	FACE WATER OVERLAND/FLOOD MIGRATION	N COMPONENT SCO	ORE		
30.	Component Score (S _{of}) ^c (highest score from line 29 for all watersheds evaluated, subject to a maximum of 100)	100		19.14	

Maximum value applies to waste characteristics category.

b Maximum value not applicable.

^c Do not round to nearest integer.

AMAX Phosphate Facility

Location:

Palmetto, Manatee County, Florida

SOIL EXPOSURE PATHWAY SCORESHEET

	Factor Categories and Factors	Maximum Value	Value Assigned	
RE	SIDENT POPULATION THREAT			
	Likelihood of Exposure			
1.	Likelihood of Exposure	550		550
	Waste Characteristics			
2.	Toxicity	a .	10,000	
3.	Hazardous Waste Quantity	a	10 ⁶	
4.	Waste Characteristics	100		100
	Targets			
5.	Resident Individual	50	0	
6.	Resident Population	50		
0.	6a. Level I Concentrations	ь	0	
	6b. Level II Concentrations	b	0	
	6c. Resident Population (lines 6a + 6b)	Ъ		
7.	Workers	15	10	
8.	Resources	5	0	
9.	Terrestrial Sensitive Environments	c	0	
10.	Targets (lines $5 + 6c + 7 + 8 + 9$)	b		10
	Resident Population Threat Score			
11.	Resident Population Threat			
	(lines 1 x 4 x 10)/82,500	b		6.67
NEA	RBY POPULATION THREAT			
	Likelihood of Exposure			
12.	Attractiveness/Accessibility	100	5	
13.	Area of Contamination	100	100	
14.	Likelihood of Exposure	500		50
	Waste Characteristics			
15.	Toxicity	a	104	
16.	Hazardous Waste Quantity	a	10 ⁶	
17.	Waste Characteristics	100		100

Site Name:	AMAX Phosphate Facility	
Location:	Palmetto, Manatee County Florida	

SOIL EXPOSURE PATHWAY SCORESHEET (contined)

	Factor Categories and Factors	Maximum Value	Value Assigned	
NE	ARBY POPULATION THREAT, (continued)			
	Targets			
18.	Nearby Individual	1	1	
19.	Population Within 1 Mile	b	2.7	
20.	Targets (lines 18 +19)	· b		3.7
	Nearby Population Threat Score			
21.	Nearby Population Threat (lines 14 x 17 x 20)	b		0.22
SOI	L EXPOSURE PATHWAY SCORE		Nearby Population Threat: (Default Value)	2
22.	Soil Exposure Pathway Score ^d (S _a), (lines [11 + 21] subject to a maximum of 100)	100		8.67

Maximum value applies to waste characteristics category.

b Maximum value not applicable.

No specific maximum value applies to factor. However pathway score based solely on sensitive environments is limited to maximum of 60.

Do not round to nearest integer.

Site Name:	AMAX Phosphate Facility
Location:	Palmetto, Manatee County, Florida

AIR MIGRATION PATHWAY SCORESHEET

FACTOR CATEGORIES AND FACTORS

	Likelihood of Release	Maximum Value	Value Assigned	
1.	Observed Release	550	0	
2.	Potential to Release			
	2a. Gas Potential to Release	500	190	
	2b. Particulate Potential to Release	500	340	
	2c. Potential to Release (higher of lines 2a and 2	b) 500	340	
3.	Likelihood of Release (higher of lines 1 and 2c)	a		340
	Waste Characteristics			
4.	Toxicity/Mobility	a	1000	
5.	Hazardous Waste Quantity	a	10 ⁶	
6.	Waste Characteristics	100		100
	Targets			
7.	Nearest Individual	50	20	
8.	Population			
	8a. Level I Concentrations	ь	0	
	8b. Level II Concentrations	Ъ	0	
	8c. Potential Contamination	ь	5	
	8d. Population (lines 8a + 8b + 8c)	ь	5	
9.	Resources	5	5	
10.	Sensitive Environments			
	10a. Actual Contamination	C	0	
	10b. Potential Contamination	С	2.9	
	10c. Sensitive Environments (lines 10a + 10b)	С	2.9	
11.	Targets (lines 7 + 8d + 9 + 10c)	ь		32.9
	Air Migration Pathway Score			
12.	Pathway Score (S _a)			
	[(lines 3 x 6 x 11)/82,500] ^d	100		13.56

Do not round to nearest integer.

Maximum value applies to waste characteristics category.

b Maximum value not applicable.

No specific maximum value applies to factor. However pathway score based solely on sensitive environments is limited to maximum of 60.

accepted -41/91
Described

FINAL REPORT

SITE INSPECTION

AMAX PHOSPHATE FACILITY

PALMETTO, MANATEE COUNTY, FLORIDA

EPA ID #: FLD043055151

Prepared Under TDD No. F4-9009-01 Contract No. 68-01-7346

Revision 0

FOR THE

WASTE MANAGEMENT DIVISION
U.S. ENVIRONMENTAL PROTECTION AGENCY

JUNE 24, 1991

HALLIBURTON NUS ENVIRONMENTAL CORPORATION SUPERFUND DIVISION

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EXECUTIVE SUMMARY

The AMAX Phosphate Facility is located on approximately 670 acres, 6 miles north of Palmetto, Manatee County, Florida. Operations began at this facility in 1966. Currently, it is owned and operated by Royster Phosphates, Inc. Phosphate ore is transported to the facility, where it is converted to phosphoric acid and diammonium phosphate. Along with a gypsum/cooling pond complex, AMAX consists of sulfuric acid, phosphoric acid, and ammoniated fertilizer plants.

The potential for pollution of air and water are inherent in the production and use of fertilizers. The plant's process water has a low pH with a high concentration of inorganic by-products. In addition to high levels of radioactive particle emissions (including mostly uranium-236, uranium-238, radium-226), there are also elevated concentrations of arsenic, cadmium, chromium, lead, sodium, fluoride, manganese, iron, sulfate, and total dissolved particles. Also, air contamination from escaping dust and fumes from the plant's stacks can transmit airborne particulate pollutants and by-products. Additionally, the low pH of the process water causes the reaction of acid with fluoride impurities to produce gaseous hydrogen fluoride.

AMAX Phosphate is located in the Gulf Central Lowlands subdivision of the Atlantic (Gulf) Coastal Plain physiographic province and the southeast coastal plain hydrogeologic setting in northwest Manatee County, Florida. The facility is underlain by Miocene to Recent undifferentiated surficial sands, sandy limestone, and shells. These undifferentiated surficial deposits are 1 to 35 feet thick with an average depth to groundwater of 4 to 10 feet below land surface. The Miocene Hawthorn Group underlies the surficial aquifer system and ranges from 1 to 35 feet to a total of 356 to 400 feet thick. This formation acts as an upper confining unit for the underlying Floridan Aquifer System, which is a continuous sequence of carbonate rocks of generally high permeability.

Within the 4-mile radius of the facility, a portion of the population obtains potable water from shallow private or community wells completed in the surficial aquifer. Groundwater is also used for irrigation of farms and groves.

Surface water run-off from the facility is directed to a ditch system surrounding the waste source areas. These ditches can empty into one of two canals on either the northern or southern portion of the property. Currently, only the northern one is used for discharge by the plant. These canals empty into creeks, and both eventually flow into Tampa Bay to complete surface water migration pathway. Additionally, the surrounding area is composed of a large number of wetlands which also accept

drainage from the site. Drainage from the wetlands flows into the Little Manatee River on the north and Tampa Bay on the west. The Manatee River also eventually empties into Tampa Bay. Fishing, boating, and bathing occur in these waters. Also, several state- or federally designated protected or endangered species have ranges in the area. In fact, there is a critical habitat for the endangered Florida manatee (<u>Trichechus manatus</u>) located 6.5 miles from AMAX. Since the plant is in a flood plain, there is also a potential threat from flooding during wet weather.

During this sampling investigation, 44 environmental samples were collected. These include soil, groundwater, sediment, and surface water samples. The only organic pollutants of concern detected in elevated quantities in soil were toluene and carbon disulfide. Carbon disulfide, a by-product in the sulfuric acid manufacturing process, was also found in one groundwater sample collected from an onsite monitoring well. No organic compounds of concern, which are associated with the processes at the plant, were found in either sediment or surface water samples.

A sample of newly deposited gypsum was analyzed. It contained the following metals: aluminum, barium, calcium, chromium, iron, lead, magnesium, manganese, nickel, selenium, and vanadium. Those inorganics of concern detected in elevated quantities in soil samples, and also found in the gypsum, were barium, cadmium, chromium, manganese, nickel, selenium, and vanadium. Only cadmium and manganese were detected in elevated quantities in one onsite groundwater sample. The primary EPA maximum contaminant level (MCL) for drinking water standards was exceeded for manganese in this sample. Although the quantity of arsenic was not elevated, the MCL was exceeded for it in one groundwater sample collected on site. Additionally, the secondary MCL for drinking water standards for iron (300ug/l) was exceeded in seven of the onsite groundwater samples.

Chromium, lead, and vanadium were detected in elevated quantities in a sediment sample collected from the drainage ditch, while the only surface water sample containing elevated amounts of inorganics, including cadmium, chromium, lead, manganese, nickel, and vanadium, was taken from the cooling pond. There was no evidence of migration of these contaminants along the surface water pathway.

Analysis for radioactive nuclides in soil samples revealed that the onsite soil sample contained an elevated amount of radium-226 but not radium-228. Also, the amount of this nuclide in the southern drainage pathway was more elevated than in the northern drainage pathway. Values of radium-226 and radium-228 were elevated for the gypsum sample. However, none of these values exceeded the National Council on Radiation Protection and Measurements (NCRP) maximum criteria for radium-226 deposition on agricultural land (40 pCi/g). For groundwater samples, the MCL for primary drinking water standards was exceeded for gross alpha particle activity (15 pCi/l) for the background

and one onsite surficial aquifer monitoring well sample. Additionally, the combined radium-226, radium-228 MCL (5 pCi/l) was also exceeded for these two samples. This value for radium-226 was exceeded for the surface water sample collected in the southern drainage pathway too. Unlike the organic and inorganic results, the elevated radium-226 values for the surface water and sediment samples collected in the southern drainage pathway indicate migration of this nuclide from AMAX along the surface water pathway.

Because of the targets associated with the four contaminant pathways and the elevated quantities of contaminants found at AMAX Phosphate, FIT 4 recommends that this site be evaluated using the HRS (effective March 14, 1991).

1.0 INTRODUCTION

The HALLIBURTON NUS Environmental Corporation Region 4 Field Investigation Team (FIT) was tasked by the U.S. Environmental Protection Agency (EPA), Waste Management Division to conduct a Site Inspection (SI) at the AMAX Phosphate Facility in Palmetto, Manatee County, Florida. The investigation was performed under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA). The task was performed to satisfy the requirements stated in Technical Directive Document (TDD) number F4-9009-01. The field investigation was conducted the week of October 16, 1990.

1.1 OBJECTIVES

The objectives of this inspection were to determine the nature of contaminants present at the site and to determine if a release of these substances has occurred or may occur. Further, this inspection sought to determine the possible pathways by which contamination could migrate from the site and the populations and environments it would potentially affect. Through these objectives, a recommendation was made regarding future activities at the site.

1.2 SCOPE OF WORK

The objectives were achieved through the completion of a number of specific tasks. These activities were to:

- Obtain and review relevant background materials.
- Obtain information on local water systems.
- Determine location of and distance to nearest potable well.
- Evaluate potentially affected populations and environments associated with the groundwater, surface water, air, and soil exposure pathways.

- Develop a site sketch, to scale.
- Collect environmental samples.

2.0 SITE CHARACTERIZATION

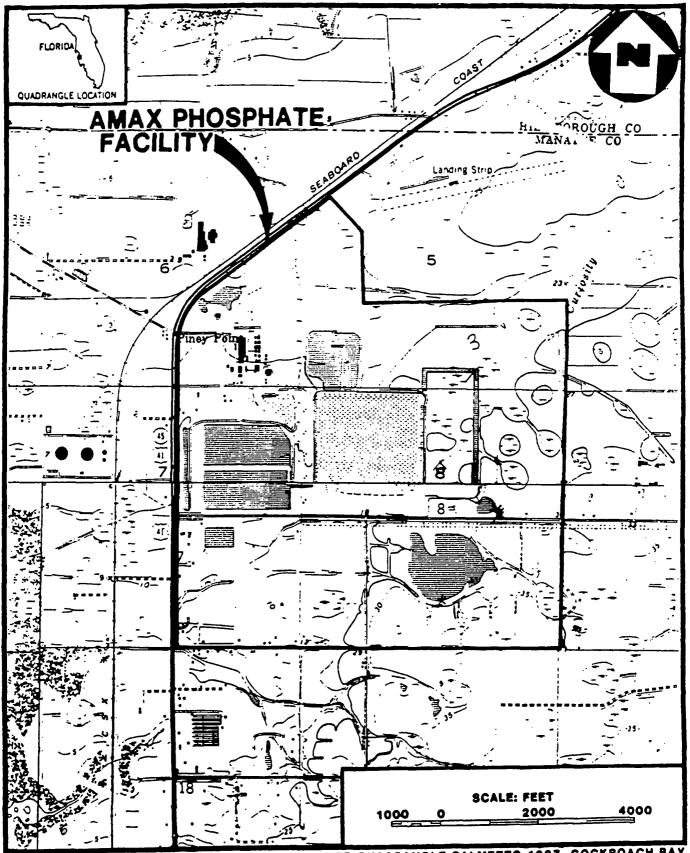
2.1 SITE HISTORY

The AMAX Phosphate Facility, Piney Point Complex site is located on approximately 670 acres, 6 miles north of Palmetto, in the northwestern corner of Manatee County, Florida (Appendix A). Phosphate ore is transported to AMAX, where it is converted to phosphoric acid and diammonium phosphate (DAP). This facility includes sulfuric acid, phosphoric acid, and ammoniated fertilizer plants along with a gypsum stack/cooling pond complex (Ref. 1). A site location map appears in Figure 1.

AMAX began operations at the facility in 1966 and expanded in 1978 (Ref. 1). It was then sold to Consolidated Minerals, Inc. of Plant City, Florida, at an unknown date, some time after February 1987 (Refs. 1, 2). At the end of 1988, Royster Phosphates, Inc. purchased the facility from Consolidated (Ref. 3). On November 1, 1990, Royster sold the plant to Atlantic Fertilizer Company as a joint venture with Gulf Atlantic; however, Royster is still responsible for the facility's management (Ref. 4).

The plant has been permitted by the Florida Department of Environmental Regulation (FDER) to discharge process and nonprocess wastewater into two drainage ditches. Outfalls 001 and 003, to the south of the facility, flow into a drainage ditch which empties into Bishop Harbor, an outlet to Tampa Bay, while Outfall 002, to the north, drains into a ditch which discharges into Piney Point Creek, then into Tampa Bay (Ref. 5). Outfalls 001 and 002 are for nonprocess water, while Outfall 003 is for treated process water. Outfall 001 was used for the last time in September 1989, and 003 was last used in March 1989. Presently, Outfall 002 is the only one used. All three outfalls are still permitted (Refs. 4, 6).

In 1982, a study was conducted by the U.S. Geological Survey on the effect of groundwater contamination in the area of gypsum stacks. The following contaminants were present in excess of primary drinking water standards at AMAX: silver, arsenic, chromium, cadmium, lead, fluoride, and selenium. Elevated levels of these inorganics in the groundwater extended to 50 feet beyond the stacks for silver, lead, fluoride, and selenium; to 200 feet for arsenic and cadmium; and to 300 feet for arsenic and cadmium; and to 300 feet for chromium (Ref. 1, p. 6, Tables 2, 3). Additionally, a groundwater monitoring plan was submitted to the FDER, Southwest District, in September 1983, and issued in September 1985, but was withdrawn in October 1985. After the company collected and submitted more information, the second permit was issued in March 1987. During this monitoring, groundwater quality problems, which include the following quantities exceeding primary drinking



BASE MAP IS A PORTION OF THE U.S.G.S. 7.5 MINUTE QUADRANGLE PALMETTO 1987, COCKROACH BAY 1981, FLORIDA

FIGURE 1
PALMETTO, MANATEE COUNTY, FLORIDA



water standards, were noted in 1988: sodium (180 mg/l), sulfate (745 mg/l), total dissolved solids (TDS) (1586 mg/l), manganese (0.31 mg/l), and iron (2.9 mg/l) (Ref. 1).

2.2 SITE DESCRIPTION

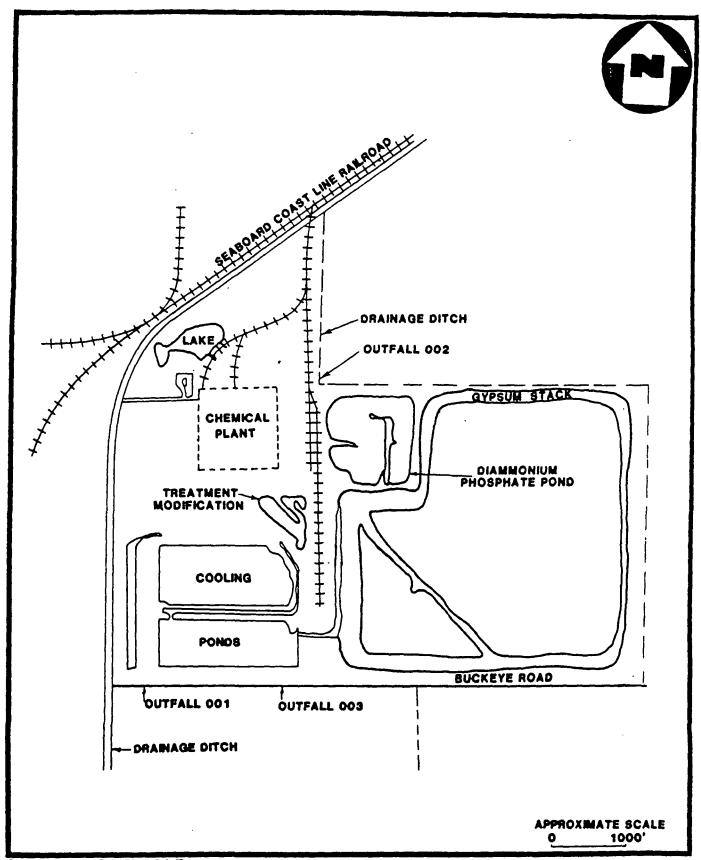
2.2.1 <u>Site Features</u>

AMAX Phosphate is a phosphoric acid complex situated on approximately 670 acres of flat terrain. It is bordered on the west by Highway 41, on the south by Buckeye Road and a citrus grove, on the east by farmland, and on the north by the Manatee Airport, a landing strip. A drainage ditch for nonprocess water on the northern border empties into Piney Point Creek and then into Tampa Bay approximately 2 miles west of the facility, while a drainage ditch along the southern border empties into Bishop Harbor 1 mile to the west, and this also converges with the bay (Appendix A). The plant is fenced on the western, northern, and eastern borders with a guardhouse to the north. Access can be gained by foot on Buckeye Road at the southern border (Ref. 4).

As stated in the preceding section, the complex includes several parts associated with the manufacturing process. An approximately 5-acre manufacturing portion, located to the northwest, consists of sulfuric acid, phosphoric acid, and DAP plants. The largest portion of the property is used for gypsum stacks, the calcium sulfate by-product from the phosphoric acid process, which occupy approximately 253 acres on the southeast. The stacks are surrounded by a drainage ditch that channels water from the stacks back to the plant and also inhibits lateral migration of leachate from the gypsum. There is also a 32-acre DAP pond in the northwest corner of the gypsum stack area, while a 77-acre cooling pond is located in the southwestern corner. Additionally, there is a 1-acre, ammonia removal pond northeast of the cooling pond. Process and nonprocess water, along with gypsum, are pumped to waste disposal areas on the facility, and a network of drainage ditches ultimately leads to the two ditches mentioned above. Railroad tracks, with a spur going into the plant on the northern border of the property, are located along the western border (Ref. 4). A site layout map appears in Figure 2.

2.2.2 Waste Characteristics

The main products which AMAX produces and sells are phosphoric acid and the fertilizer, DAP. In order to make these products, the plant first manufactures sulfuric acid which is used to digest the phosphate ore. The phosphoric acid, produced in this process, is then reacted with ammonia to yield the final product, DAP. AMAX manufactures 2,000 tons of sulfuric acid per day by burning sulfur in air in the presence of a catalyst. Then, the sulfur oxide formed is absorbed in water to produce the



SITE LAYOUT MAP AMAX PHOSPHATE PALMETTO, MANATEE COUNTY, FLORIDA



acid. Brink mist eliminators in towers remove escaping acid mist and sulfur oxide before they are released into the environment. This facility's sulfuric acid plant is the largest single-unit plant in the world. Besides using all of the acid it produces, AMAX purchases an additional 300 tons per day.

Phosphate rock is purchased from a mine in Hillsborough County, Florida. It is crushed and slurried with sulfuric acid. The resulting slurry is filtered to remove the phosphoric acid, formed in the process, from the calcium sulfate or gypsum. The latter is pumped to a gypsum stack/cooling pond complex. The acid formed during this process is concentrated to 54 percent. Impurities in the acid are removed and shipped out of the plant in tanks. The process water from this production has an acidic pH between 1.8 and 2.0. It is used to transport the gypsum to the top of the stack and is recirculated to the plant (Refs. 4, 7). Exhaust from the production is washed with recycled water to remove harmful gases before it is discharge from the stack (Refs. 4, 7).

In order to produce DAP 18-46-0, anhydrous ammonia, phosphoric acid, and 75 percent phosphate rock are mixed together. The resulting slurry is pumped to a solid-materials handling system where the aqueous portion is removed, and the DAP is dried. This plant is one of the largest of its kind in the world. Scrubbers inhibit dust and fumes from being released into the atmosphere. The final product is either used directly as fertilizer or is processed further by other fertilizer plants (Refs. 4, 7).

In the production of DAP and phosphoric acid, gases and particulates are captured by water stream scrubbers. This water is recirculated and reused in production processes. Water is used to slurry the gypsum, and after depositing the gypsum, this water is also recirculated. Once water has come in contact with either the gaseous emissions, dust, or gypsum, it is contaminated and cannot be released by the plant; therefore, excess water is kept in holding ponds. In order to minimize the volume of water, there is an evaporation system consisting of sprayers in the holding areas. During the rainy season when accumulation is increased, water is treated before it is released from the site. Before releasing the water, fluorides and phosphorous products are removed as solids and deposited on the gypsum stacks, and the acidic pH is neutralized with lime (Refs. 4, 7).

The potential for pollution of air and water is inherent in the production and use of fertilizers. The impurities resulting from these manufacturing processes can be inadvertently released into the environment through several pathways and consist of a variety of substances. The plant process water characteristically has a low pH and contains a high concentration of inorganic by-products from the phosphate rock. In addition to high levels of radioactive particle emissions (including mostly uranium-238, radium-226), there are also elevated concentrations of arsenic, cadmium, chromium, lead, sodium, fluoride, manganese, iron, sulfate, and TDS. A study conducted by the Environmental Protection Agency (EPA) indicated that only radium-226, uranium-238, chromium, and arsenic were

present in large enough quantities in phosphogypsum to exceed health-based screening limits (Ref. 8, pp. 12-6, 12-7). Leachate, however, has a higher concentration of contaminants of concern. It was found that the following concentrations of metals in leachate provided a potential health or environmental risk if released into either groundwater or surface water: arsenic, lead, cadmium, chromium, fluoride, zinc, antimony, copper, thallium, nickel, iron, silver, and mercury (Ref. 8, pp. 12-8, 12-9).

Unless the gypsum stacks and cooling ponds are underlain with an impervious liner, contaminants can be discharged to groundwater; however, the soils under the stacks can neutralize or buffer the pH causing some contaminants to precipitate from solution and thus attenuate their migration (Refs. 1; 8; 9, pp. 7, 10; 10, pp. 105-108, 114-119). Also, phosphates, when released into the environment, increase algal growth in surface water which upsets the natural biological balance (Ref. 11, p. 471). Because of the low pH of the process water, some of the fluorides are converted to gaseous hydrogen fluoride and transmitted into the environment during the sprinkling involved with the evaporation process on the gypsum stacks. Fluorides have been periodically found in citrus tree foliage and grass used for cattle grazing in the area (Ref. 4). Additionally, escaping dust and fumes from the plant's stacks can transmit airborne particulate pollutants and by-products.

3.0 REGIONAL POPULATIONS AND ENVIRONMENTS

3.1 POPULATION AND LAND USE

3.1.1 Demography

AMAX Phosphate Facility is located in a sparsely populated area that is mainly used for agriculture and heavy industry (Ref. 4, Appendix A). The total population within a 4-mile radius is 3,817 with the following distribution: 251 between 0 and 1 mile (3.8 residents/residence x number of residences), 679 between 1 and 2 miles, 221 between 2 and 3 miles, and 2,666 between 3 and 4 miles (Ref. 12, Appendix A). There are no schools within 4 miles of the facility (Appendix A).

3.1.2 Land Use

There is a landing strip, Manatee Airport, directly to the north. The immediate area to the south consists of a citrus grove, while there is a cattle ranch and turf farm to the west. The closest neighbors are located in four trailers 50 feet east of the gypsum stacks. The area surrounding the facility is also composed of a large concentration of wetlands (Refs. 4, 13, Appendix A). During the investigation, stressed vegetation was noted along the plant's borders. Also, at times large volumes of smoke were seen emitting from the facility's stacks (Refs. 4, 13). A number of species, having either state or federal protection status, inhabit the area (Ref. 14).

3.2 SURFACE WATER

3.2.1 Climatology

The climate in Manatee County is characterized by long, warm, humid summers and short, mild winters. Average monthly temperatures range from 61°F in January to 82°F in July and August with an average annual temperature of 73°F. Although some rainfall occurs during every month, the season with the highest rainfall extends from June through September (Ref. 15, p. 11). The net annual rainfall is 4 inches (Ref. 16, pp. 43, 63), while the 1-year, 24-hour rainfall is also 4 inches (Ref. 17, p. 93).

3.2.2 Overland Drainage

Surface water run-off from the facility is directed to a ditch system surrounding the waste source areas. These ditches, which accept process and nonprocess water, eventually drain into two canals, one to the north and one running parallel to Buckeye Road on the south. Formerly, two outfalls, 001 and 003 for nonprocess and process water respectively, emptied into the latter canal. This canal also receives drainage from the agricultural land on the west. It flows under Highway 41 and converges with a railroad canal. This canal enters a creek leading to Bishop Harbor 1 mile west of the site, and Bishop Harbor flows into Tampa Bay 1 mile downgradient from this point. Outfall 002, for nonprocess water, is currently in use. It enters a canal on the northern part of the site and flows west under Highway 41 into Piney Point Creek 2,500 feet from AMAX. This creek converges with Tampa Bay 2 miles northwest of the plant (Refs. 4, 13, Appendix A). Additionally, the surrounding area is composed of a large number of wetlands which may accept drainage from the site. Eventually, these wetlands drain into small creeks that also flow toward Tampa Bay (Appendix A).

3.2.3 Potentially Affected Water Bodies

During the site investigation, people were seen fishing in Bishop's Creek which accepts run-off from the canal south of the plant (Ref. 4, p. 23). Also, Bishop's Harbor is often used for recreational fishing (Ref. 6). The Tampa Bay area supports additional recreational activities such as boating and swimming (Ref. 4, Appendix A). The Manatee County Water Department obtains water from Lake Manatee, which is not on the surface water migration pathway. The remainder of the people obtain potable water from private or community wells; therefore, there are no intakes along the surface water migration pathway (Ref. 4). Part of the plant, along with the area to the west toward Tampa Bay, is on a flood plain. During flooding, the migration of contaminants from the site to the surface water system would be enhanced (Ref. 18). Several state- and federally protected or endangered species inhabit the area (Refs. 8, pp. 12-17, 12-18; 14). In fact, the endangered Florida manatee (Trichechus manatus) is often sighted in the Little Manatee River (Ref. 4). A critical habitat for this species is located 6.5 miles from the plant (Ref. 8, pp. 12-17, 12-18).

3.3 GROUNDWATER

3.3.1 Hydrogeology

The AMAX Phosphate Facility is located in the Gulf Central Lowlands subdivision of the Atlantic (Gulf) Coastal Plain physiographic province and the southeast coastal plain hydrogeologic setting in northwest Manatee County, Florida (Refs. 15, p. 105; 19, plate 28; 20, pp. 277-278). Elevations at the facility range between 8 and 35 feet above mean sea level (amsl) (Appendix A). The major soil types in the area of the facility include the Palmetto, Wabasso, Eau Gallie, and Bradenton fine sands and the Chobee loamy fine sand (Ref. 21, plates 1, 5).

The facility is underlain by Miocene to Recent undifferentiated surficial sands, sandy limestone, and shells whose composition may vary laterally and vertically. These undifferentiated surficial deposits range between approximately 1 to 35 feet thick, and comprise the unconfined surficial aquifer system (Refs. 15, p. 129; 22, p. 62). The average depth to the water table in the area of the facility ranges between 4 and 10 feet below land surface (bls) (Ref. 4). The water table forms a subdued replica of the topographic surface in the area. Seasonal fluctuations of water levels in the surficial aquifer are generally less than 5 feet and are very dependent upon the availability of water (Ref. 15, p. 129). Transmissivity values of the surficial aquifer in Manatee County range from less than 267 to approximately 5,304 ft²/day (Ref. 15, Table 3, p. 35, p. 129). Estimates of storage coefficients of the surficial aquifer range between 0.05 and 0.12, based on laboratory specific-yield tests of sands, sandy limestone, and shells of similar composition to those in the surficial aquifer in Manatee County (Ref. 15, p. 131).

The Miocene Hawthorn Group underlies the surficial aquifer system. The Hawthorn Group ranges between 1 to 35 feet bls and ranges between 356 and 400 feet thick in the facility area (Refs. 15, p. 129; 22, Figure 38, p. 62). The Arcadia Formation and the Tampa Member of the Arcadia Formation comprise the Hawthorn Group in the area of the facility (Ref. 22, Figure 38, p. 62). The Arcadia Formation consists of limestone and dolostone containing varying amounts of quartz sand, clay, and phosphate grains. Sand lenses composed of very fine- to medium-grained quartz sand occur irregularly throughout the formation and are usually less than 5 feet thick. Discontinuous clay lenses also occur sporadically throughout the Arcadia Formation. The clay lenses are generally less than 5 feet thick and are composed of quartz sandy, silty, phosphatic, and dolomitic clays (Ref. 22, p. 58). The Arcadia Formation is approximately 221 feet thick in the area of the facility (Ref. 22, Figure 38, p. 62).

The Tampa Member of the Arcadia Formation is composed primarily of limestone with minor dolomite, sands, and clays. The Tampa Member is approximately 135 feet thick in the area of the facility. The texture and composition of the limestones range from mudstones to packstones. The dolostones range from microcrystalline to very fine-grained in texture and are quartz sandy and clayey in composition with minor to no phosphate. Sand and clay beds occur occasionally within the Tampa Member and are similar in composition and thickness as those found in the overlying Arcadia Formation, except for a significantly lower phosphate content (Ref. 22, p. 70).

The Hawthorn Group acts as an upper confining unit for the underlying Floridan Aquifer System. The rocks that comprise the upper confining unit vary greatly in lithology and are complexly interbedded. Clay beds found in the Hawthorn Group act as very effective confining beds. Vertical hydraulic conductivity values for Hawthorn Group clays, as established from aquifer tests and core samples, range between 5.29×10^{-6} and 2.75×10^{-10} cm/sec (1.5×10^{-2} and 7.8×10^{-7} ft/day) (Ref. 23, p. B-43).

The Oligocene Suwannee Limestone underlies the Hawthorn Group. The Suwannee Limestone is composed of hard, yellow to creamy, fossiliferous limestones. The upper part of the Suwannee Limestone contains thin, discontinuous chert lenses; the basal portion is interbedded with quartz sand and dolomite. The Suwannee Limestone ranges up to approximately 300 feet thick (Refs. 15, p. 28; 23, pp. B-32, B-33).

The Eocene Ocala Limestone underlies the Suwanee Limestone. The Ocala Limestone consists of three units: the Crystal River Member, the Williston Member, and the Inglis Member. All three members are composed of cream to white fossiliferous limestone interbededded with chert beds. The Inglis Member of the Ocala Limestone often contains gray to brown dolomite. The Ocala Limestone ranges between 300 and 600 feet thick (Refs. 15, p. 28; 23, p. 8-30).

The Eocene Avon Park Formation underlies the Ocala Limestone. The Avon Park Formation consists of brown fossiliferous limestone. The upper portion of the Avon Park Formation occasionally contains layers of carbonaceous material or peat, and the basal portion may contain small evaporite lenses. The Avon Park Formation may be greater than 1,000 feet thick (Refs. 15, p. 28; 23, pp. B-25, B-27).

The Lower Eocene Oldsmar Formation underlies the Avon Park Formation. The Oldsmar Formation consists of micritic to finely pellital limestone thinly interbedded with fine- to medium-crystalline, vuggy dolomite. The basal portion of the formation is usually more extensively dolomitized than the upper portion and contains pore-filling gypsum deposits and thin beds of anhydrite. The Oldsmar Formation and other lower Eocene carbonate rocks are approximately 1,500 feet thick (Ref. 23, pp. B-22-B-23, plates 3, 33).

The Floridan Aquifer System is a vertically continuous sequence of carbonate rocks of generally high permeability that ranges from late Paleocene to early Miocene age. Less permeable carbonate rocks separate the aquifer system into two aquifers: the Upper and Lower Floridan aquifers (Ref. 23, p. B-45). The Upper Floridan aquifer is composed of the lower portion of the Tampa Member of the Arcadia Formation (Hawthorn Group), the Suwannee Limestone, the Ocala Limestone, and the Avon Park Formation (Ref. 23, pp. B-44, B-47). The top of the Upper Floridan aquifer ranges from 357 to 400 feet bls in the area of the facility (Refs. 22, p. 62; 23, plate 26). The Upper Floridan aquifer is approximately 1,250 feet thick (Ref. 23, plate 28). Transmissivity values range from approximately 4,900 to 160,000 ft²/day (Ref. 15, p. 137). The storage coefficients of the Upper Floridan aquifer in Manatee County range from 2.0 x 10-4 to 2.0 x 10-3. Leakage to the Upper Floridan aquifer is estimated to range from 4.0 x 10-5 to 2.7 x 10-3 ft/day) (Ref. 15, p. 137). The base of the Upper Floridan aquifer is located at approximately -1,650 amsl (Ref. 23, plate 29). The Avon Park Formation is the deepest potable, water-bearing formation in the Upper Floridan aquifer (Ref. 15, p. 28).

3.3.2 Aquifer Use

Within a 4-mile radius of AMAX, the majority of people to the southwest, obtain potable water from the Manatee County Water Department. The remaining people receive water from either private or community wells (Refs. 4, 24, 25). A house count using topographic maps indicates that there are 251 residences using wells within 3 miles of the facility with an additional 260 within 3 to 4 miles (Appendix A). The majority of these wells are completed in the surficial aquifer. Groundwater is also used for irrigation of the farms and groves (Ref. 25).

4.0 FIELD INVESTIGATION

4.1 SAMPLE COLLECTION

During the field investigation, conducted the week of October 15, 1990, FIT 4 attempted to identify and characterize contaminants which may be present in the environment as a result of activities that were conducted at AMAX Phosphate Facility. To accomplish this, FIT 4 collected environmental surface soil, subsurface soil, sediment, surface water, and groundwater samples from a number of strategic locations. These locations were selected based on historical information, hydrogeological data for the region and site area, and direct observation at the site.

4.1.1 Sample Collection Methodology

All sample collection, sample preservation, and chain-of-custody procedures used during this investigation were in accordance with the standard operating procedures as specified in Sections 3 and 4 of the Engineering Support Branch Standard Operating Procedures and Quality Assurance Manual; United States Environmental Protection Agency, Region IV, Environmental Services Division, April 1, 1986.

4.1.2 **Duplicate Samples**

Duplicate samples were offered to and declined by Ivan Nance, a designated representative of Royster Phosphates, Inc. Receipt for sample forms are on file at FIT 4.

4.1.3 Description of Samples and Sample Locations

During the sampling investigation, a total of 44 environmental samples were collected. The samples collected in each media include the following: six surface soil and one gypsum, six subsurface soil, nine surface water, 11 sediment, five groundwater from temporary wells, five groundwater from existing monitoring wells, and one groundwater from a private well. Subsurface soil samples were collected 4 to 10 feet below land surface (bls) at the zone of saturation. Groundwater samples were taken from the same depths.

Four sets of surface soil, subsurface soil, and groundwater samples were taken in conjunction with each other. Two of these sets, one collected to the north of AMAX (AP-SS-01, AP-SB-01, AP-TW-01)

and one to the east (AP-SS-02, AP-SB-02, AP-TW-02) served to establish background conditions. The remaining two sets were collected near waste source areas to determine migration of contaminants. One was taken southwest of the chemical plant (AP-SS-04, AP-SB-04, AP-TW-04) and the other west of the cooling pond (AP-SS-05, AP-SB-05, AP-TW-05). Another surface soil sample was taken near the diammonium phosphate (DAP) pond (AP-SS-03) with the subsurface and groundwater samples (AP-SB-03, AP-TW-03) collected a few feet to the west of the corresponding surface soil sample. A final set of soil samples (AP-SS-06, AP-SB-06) was collected between the cooling pond and drainage ditch. In order to characterize the contaminants in gypsum, a freshly deposited sample (AP-SS-07) was removed from the gypsum stacks.

Nine sets of surface water and sediment samples were collected in conjunction with each other. Two sets, one collected north of the site in the Little Manatee River (AP-SW-01, AP-SD-01) and the other southeast of the facility in Cabbage Slough Creek (AP-SW-02, AP-SD-02) served to establish background conditions. In order to characterize contaminants, two sets were taken from source areas, the cooling (AP-SW-09, AP-SD-09) and ammonia removal (AP-SW-11, AP-SD-11) ponds. Five sets were collected from locations to determine if pollutants were migrating from the facility. Two of these were taken along the drainage pathway of outfalls 001 and 003, which are no longer in use. One set (AP-SW-04, AP-SD-04) was collected downgradient from the outfalls in the drainage ditch and the other (AP-SW-05, AP-SD-05) at the confluence of the ditch and Bishop Creek. The remaining three sets were collected in the drainage pathway of Outfall 002. One of these (AP-SW-06, AP-SD-06) was taken in the drainage ditch downgradient from the outfall, another (AP-SW-07, AP-SD-07) a few feet west, and the third (AP-SW-08, AP-SD-08) in Piney Point Creek. A tenth sediment sample (AP-SD-10) was also collected from the DAP pond to characterize contaminants, and another (AP-SD-12) was taken from the drainage ditch by the gypsum stacks to determine migration of contaminants from the stacks.

Five groundwater samples were collected from existing monitoring wells to determine if contaminants had migrated into the groundwater. Four of these samples (AP-MW-01, AP-MW-03, AP-MW-04, AP-MW-05; 12.5 - 20.15 feet bls) were from wells installed in the surficial aquifer and the fifth from a well installed in the the intermediate aquifer (AP-MW-06; 63.7 feet bls). Also, a private well (AP-PW-01) to the east of AMAX was sampled. Sample codes, descriptions, locations, and rationale are contained in Tables 1, 2, and 3. Sample locations are shown in Figures 3, 4, and 5.

SAMPLE CODES, DESCRIPTIONS, LOCATIONS, AND RATIONALE SOIL SAMPLES AMAX PHOSPHATE FACILITY PALMETTO, MANATEE COUNTY, FLORIDA

Sample Code	Description	Location	Rationale
AP-SS-01	Surface Soil	West side of Manatee Airport Road, 2,000 feet feet north of AMAX	Establish background conditions
AP-SS-02	Surface Soil	East of gypsum stacks 50 feet from AMAX	Establish background conditions
AP-SS-03	Surface Soil	West side of DAP pond, between drainage ditch and pond	Determine migration of contaminants
AP-SS-04	Surface Soil	Southwest corner of chemical plant, west of fence	Determine migration of contaminants
AP-SS-05	Surface Soil	West of cooling pond between drainage ditch and rainwater pond	Determine migration of contaminants
AP-SS-06	Surface Soil	Between drainage ditch and cooling pond	Determine migration of contaminants
AP-SS-07	Gypsum	Gypsum stacks	Characterize contaminants
AP-SB-01	Subsurface Soil	In conjunction with AP-SS-01, collected 4' bls	Establish background conditions
AP-58-02	Subsurface Soil	In conjunction with AP-SS-02, collected 4' bls	Establish background conditions
AP-S8-03	Subsurface Soil	West of DAP pond and drainage ditch, collected 8' bls	Determine migration of contaminants
AP-SB-04	Subsurface Soil	In conjunction with AP-SS-04, collected 4' bls	Determine migration of contaminants
AP-SB-05	Subsurface Soil	In conjunction with AP-SS-05, collected 10' bls	Determine migration of contaminants
AP-SB-06	Subsurface Soil	In conjunction with AP-SS-06, collected 4' bls	Determine migration of contaminants

AP - AMAX Phosphate Facility

SS - Surface Soil SB - Subsurface Soil

SAMPLE CODES, DESCRIPTIONS, LOCATIONS, AND RATIONALE **GROUNDWATER SAMPLES** AMAX PHOSPHATE FACILITY PALMETTO, MANATEE COUNTY, FLORIDA

Sample Code	Description	Location	Rationale
AP-TW-01	Groundwater	In conjunction with AP-SS-01, collected 7' bls	Establish background conditions
AP-TW-02	Groundwater	In conjunction with AP-SS-02, collected 4' bls	Establish background conditions
AP-TW-03	Groundwater	In conjunction with AP-SS-03, collected 10' bls	Determine migration of contaminants
AP-TW-04	Groundwater	In conjunction with AP-SS-04, collected 4' bls	Determine migration of contaminants
AP-TW-05	Groundwater	In conjunction with AP-SS-04, collected 10' bls	Determine migration of contaminants
AP-MW-01*	Groundwater	Southeast corner of plant, surficial aquifer, 15.2' bls	Determine migration of contaminants
AP-MW-03	Groundwater	East of chemical plant, surficial aquifer, 21.2' bls	Determine migration of contaminants
AP-MW-04	Groundwater	North of cooling ponds, surficial aquifer, 22.6' bls	Determine migration of contaminants
AP-MW-05	Groundwater	South of Buckeye Road, surficial aquifer, 15.2' bls	Determine migration of contaminants
AP-MW-06	Groundwater	West of gypsum stack drainage ditch, intermediate aquifer, 65.5' bls	Determine migration of contaminants
AP-PW-01	Groundwater	West of gypsum stacks, 50 feet east of AMAX	Determine migration of contaminants

AP

AMAX Phosphate Facility
Groundwater, Temporary Well TW

Groundwater, Monitoring Well MW AP-MW-02 was not collected.

SAMPLE CODES, DESCRIPTIONS, LOCATIONS, AND RATIONALE SURFACE WATER AND SEDIMENT SAMPLES AMAX PHOSPHATE FACILITY PALMETTO, MANATEE COUNTY, FLORIDA

Sample Code	Description	Location	Rationale
AP-SW-01	Surface Water	Little Manatee River 5 miles north of AMAX	Establish background conditions
AP-SW-02*	Surface Water	Cabbage Slough Creek 1.5 miles east of AMAX	Establish background conditions
AP-SW-04	Surface Water	Southwest corner of AMAX in drainage ditch downgradient from outfalls 001 and 003	Determine migration of contaminants
AP-SW-05	Surface Water	Confluence of drainage ditch and Bishop Creek	Determine migration of contaminants
AP-SW-06	Surface Water	Drainage ditch downgradient from Outfall 002	Determine migration of contaminants
AP-\$W-07	Surface Water	Drainage ditch downgradient from Outfall 002 east of Highway 41	Determine migration of contaminants
AP-SW-08	Surface Water	Piney Point Creek 20 feet north of County Line Road	Determine migration of contaminants
AP-SW-09*	Surface Water	East end of cooling pond	Characterize contaminants
AP-SW-11	Surface Water	West end of ammonia removal pond	Characterize contaminants
AP-\$D-01	Sediment	In conjunction with AP-SW-01	Establish background conditions
AP-SD-02*	Sediment	In conjunction with AP-SW-02	Establish background conditions
AP-SD-04	Sediment	In conjunction with AP-SW-04	Determine migration of contaminants
AP-SD-05	Sediment	In conjunction with AP-SW-05	Determine migration of contaminants
AP-SD-06	Sediment	In conjunction with AP-SW-06	Determine migration of contaminants

AP - AMAX Phosphate Facility

SW - Surface Water SD - Sediment

AP-SW-03, AP-SW-10, and AP-SD-03 were not collected.

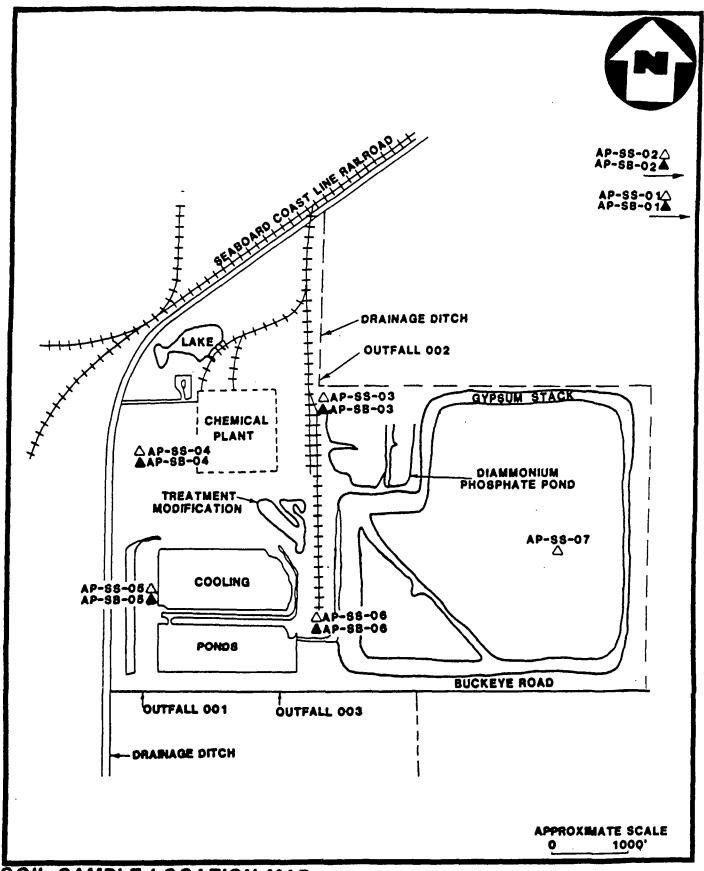
SAMPLE CODES, DESCRIPTIONS, LOCATIONS, AND RATIONALE SURFACE WATER AND SEDIMENT SAMPLES AMAX PHOSPHATE FACILITY PALMETTO, MANATEE COUNTY, FLORIDA

Sample Code	Description	Location	Rationale
AP-SD-07	Sediment	In conjunction with AP-SW-07	Determine migration of contaminants
AP-SD-08	Sediment	In conjunction with AP-SW-08	Determine migration of contaminants
AP-SD-09	Sediment	In conjunction with AP-SW-09	Characterize contaminants
AP-SD-10	Sediment	DAP pond by waste inlet	Characterize contaminants
AP-SD-11	Sediment	In conjunction with AP-SW-11	Characterize contaminants
AP-\$D-12	Sediment	Drainage ditch west of gypsum stacks	Determine migration of contaminants

AP - AMAX Phosphate Facility

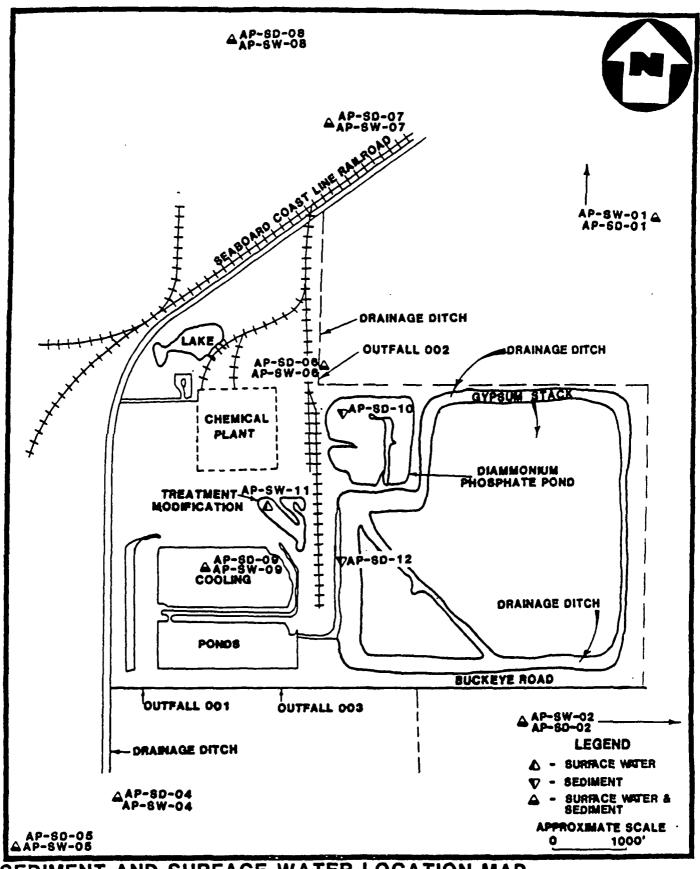
SW - Surface Water SD - Sediment

* AP-SW-03, AP-SW-10, and AP-SD-03 were not collected.



SOIL SAMPLE LOCATION MAP AMAX PHOSPHATE PALMETTO, MANATEE COUNTY, FLORIDA





SEDIMENT AND SURFACE WATER LOCATION MAP AMAX PHOSPHATE PALMETTO, MANATEE COUNTY, FLORIDA



4.1.4 Field Measurements

Field measurements were performed on all water samples (Table 4). Parameters measured included temperature, pH, and conductivity of the sample at time of collection. No field measurements were performed on the soil samples during this investigation.

4.2 SAMPLE ANALYSIS

4.2.1 Analytical Support and Methodology

All samples collected were analyzed under the Contract Laboratory Program (CLP) and analyzed for all organic parameters listed in the Target Compound List (TCL) and all inorganic parameters in the Target Analyte List (TAL). Organic analysis of soil and water samples was performed by SWOK of Broken Arrow, Oklahoma and Gulf South Environmental Laboratories of New Orleans, Louisiana. Inorganic analysis of soil and water samples was performed by Skinner and Sherman of Waltham, Massachusetts. Additionally, radioactive analysis was performed by National Air and Radiation Environmental Laboratories of Montgomery, Alabama.

All laboratory analyses and laboratory quality assurance procedures used during this investigation were in accordance with standard procedures and protocols as specified in the <u>Laboratory Operations</u> and <u>Quality Control Manual</u>, United States Environmental Protection Agency, Region IV, Environmental Services Division, issued October 24, 1990; or as specified by the existing United States Environmental Protection Agency standard procedures and protocols for the CLP Statement of Work (SOW), as applicable.

4.2.2 Analytical Data Quality and Data Qualifiers

All analytical data were subjected to a quality assurance review as described in the EPA Environmental Services Division laboratory data evaluation guidelines. In the tables, some of the concentrations of the organic and inorganic parameters have been flagged with a "J". This indicates that the qualitative analysis was acceptable, but the quantitative value has been estimated. A few other compounds are flagged with an "N", indicating that they were detected based on the presumptive evidence of their presence. This means that the compound was tentatively identified, and its detection cannot be used as positive identification of its presence. Results for some background samples are reported with a "U" flag. This flag means that the material was analyzed for but not detected. The reported number is the laboratory-derived minimum quantitation limit (MQL) for the compound or element in that sample. At times, miscellaneous organic compounds that do not

FIELD MEASUREMENTS
AMAX PHOSPHATE FACILITY
PALMETTO, MANATEE COUNTY, FLORIDA

Sample Code	Date (10/90)	Time	pН	Temp. (°C)	Conductivity (umhos/cm)
AP-SW-01	16	1330	7.0	28.3	6510
AP-SW-02*	16	1415	7.2	30.0	1250
AP-SW-04	17	1620	7.0	29.0	2540
AP-SW-05	17	1645	7.1	28.0	13,200
AP-SW-06	17	1440	8.5	30.0	1930
AP-SW-07	17	1515	6.7	30.0	2390
AP-SW-08	17	1605	6.1	28.0	1920
AP-SW-09*	17	1515	2.5	30.0	17,740
AP-SW-11	17	1445	8.9	31.0	5720
AP-TW-01	16	1625	6.7	27.0	707
AP-TW-02	17	1040	6.5	28.0	180
AP-TW-03	17	1145	6.7	28.0	3320
AP-TW-04	18	1040	6.7	27.0	2870
AP-TW-05	18	0930	6.4	26.0	3390
AP-PW-01	17	0935	7.3	24.0	1070
AP-MW-01*	16	1130	6.7	27.0	980
AP-MW-03	16	0900	6.8	26.0	4050
AP-MW-04	16	1520	7.1	27.0	932
AP-MW-05	16	1350	7.3	28.0	1570
AP-MW-06	16	1615	7.4	27.0	745

^{*} AP-SW-03, AP-SW-10, and AP-MW-02 were not collected.

SUMMARY OF ORGANIC ANALYTICAL RESULTS SURFACE AND SUBSURFACE SOIL SAMPLES AMAX PHOSPHATE FACILITY PALMETTO, MANATEE COUNTY, FLORIDA

	Backg	round	On Site				Gypsum	Backgr	ound	On Site				
PARAMETERS (ug/kg)	AP-SS-01	AP-SS-02	AP-SS-03	AP-SS-04	AP-SS-05	AP-SS-06	AP-55-07	AP-58-01	AP-SB-02	AP-58-03	AP-SB-04	AP-SB-05	AP-SB-06	
PURGEABLE COMPOUNDS													f	
TOLUENE	2)	2)	•	6)	1)	1)		6U	60	·			31	
EXTRACTABLE COMPOUNDS														
PHENOL	890U	720U	· ·				4801				٠.	·		
DI-N-BUTYLPHTHALATE	890U	720U			1201		•						· ·	
UNIDENTIFIED COMPOUNDS/NO.(1)	80001/5	30001/2	90001/6	30001/2	50003/4	20001/2	1000 <i>µ</i> 1	1	8003/1	20001/2			1ע000	
PETROLEUM PRODUCT(1)		N			N									
DODECANOIC ACID(1)							· 20001N							
HEXADECANOIC ACID(1)							4000JN						1	
PESTICIDEVICE COMPOUNDS													 	
4,4'-DOE (P,P'-DOE)	43U	39		•	•					•	-	·		
4,4°-DDT (P,P°-DDT)	43U	39	·	· _	•		•		· ·	:				
GAMMA-CHLORDANE	220U	451				<u>.</u>			· ·			· ·	·	
ALPHA-CHLORDANE	220U	52)	·	•	·		•	-			· ·		·	

- Material analyzed for but not detected above minimum quantitation limit (MQL).
- J Estimated value.
- N Presumptive evidence of presence of material.
- U Material was analyzed for but not detected. The number given is the MQL.
- (1) Tentatively identified compound. This compound is not on Target Compound List and is reported only as detected in individual samples; MQL not determined.

TABLE 6

SUMMARY OF INORGANIC ANALYTICAL RESULTS SURFACE AND SUBSURFACE SOIL SAMPLES AMAX PHOSPHATE FACILITY PALMETTO, MANATEE COUNTY, FLORIDA

ı L	Backg	round		On:	Site		Gypsum	Backg	round	<u> </u>	On	Site	
PARAMETERS (mg/kg)	AP-SS-01	AP-55-02	AP-SS-03	AP-SS-04	AP-SS-05	AP-SS-06	AP-SS-07	AP-58-01	AP-SB-02	AP-SB-03	AP-58-04	AP-58-05	AP-58-06
ALUMINUM	1600	500	4600	1300	6000	8300	1100	4500	1100	2900	1100	1700	3100
BARIUM	11	30	30	13	55	33	30	20	3U	11	5.3	5.6	18
CADMIUM	0.83U	0.63U	2.6	•	4.4	3		0 73U	0.69บ	•			
CALCIUM	45,000	2100	96,000	9200	190,000	88,000	150,000	1900	130U	42,000	600	6700	63,000
CHROMIUM	4.9	6.8	18	-	29	42	11	7.9	1.4U	6 6		4.1	5.2
COBALT	1.10	0.84U	•		2.4	1.5			•				
IRON	1500)	3001	5200)	56001	43001	70003	1800)	4300)	800)	2700J	460	700J	25003
LEAD	7,1,1	501	9.51		19)	25)	8 91	4.3J	1)	1 8)	1.43	1.3J	3.31
MAGNESIUM	4500	180	220	260	1100	2700	190	240	30U	280		•	390
MANGANESE	24	19	10		95	14	25	•		-	•	•	
NICKEL	1.7U	1.30	5.6		9	3.5	3.9			•			
POTASSIUM	160U	30U	420	•	860	820						•	•
SELENIUM	0.55UR	0.42UR	•	4.91	-		•	•	·				
SODIUM	280U	30U	1800	•	2600	2900	960	60U	30U	390		•	540
VANADIUM	SU	10	36		56	42	13	6U	10	13			

- Material analyzed for but not detected above minimum quantitation limit (MQL).
- J Estimated value.
- U Material was analyzed for but not detected. The number given is the MQL.
- R Quality Control indicates that data is unusable. Compound may or may not be present.

SUMMARY OF ORGANIC ANALYTICAL RESULTS GROUNDWATER SAMPLES AMAX PHOSPHATE FACILITY PALMETTO, MANATEE COUNTY, FLORIDA

	Backg	round	On Site				Private Well	Trip Blank				
PARAMETERS (ug/l)	AP-TW-01	AP-TW-02	AP-TW-03	AP-TW-04	AP-TW-05	AP-MW-01*	AP-MW-03	AP-MW-04	AP-MW-05	AP-MW-06	AP-PW-01	AP-P8-01
PURGEABLE COMPOUNDS												
CARBON DISULFIDE	SU	SU	•	•	•	•		14	,	130	·	
ACETALDEHYDE(1)										•		61N
EXTRACTABLE COMPOUNDS												
BENZOIC ACID	50U	423		•	·	·	•	•	•			•
BIS(2-ETHYLHEXYL) PHTHALATE	10U	10U	·		· · ·	•		76		•	· ·	·
DIETHYLMETHYLBENZAMIDE ⁽¹⁾						10JN						
BUTYLIDENEBISMETHYLETHYLMETHYLPHENOL(1)							20JN	SOIN	10JN			
OCTANOIC ACID(·)							SIN		61N			
CAPROLACTAM(1)								100JN		701N		
UNIDENTIFIED COMPOUNDSMO (1)								20 <i>W</i> 1	1001/3			1
DECANOIC ACID(1)									SIN			
BIS(HYDROXYLETHYL)DODECANAMIDE(1)	1								301N			
TETRAMETHYLBUTANE(1)			<u> </u>		7JN							1

- Material analyzed for but not detected above minimum quantitation limit (MQL).
- J Estimated value.
- N Presumptive evidence of presence of material.
- U Material was analyzed for but not detected. The number given is the MQL.
- (1) Tentatively identified compound. This compound is not on Target Compound List and is reported only as detected in individual samples; MQL not determined.
- AP-MW-02 was not collected.

TABLE 8

SUMMARY OF INORGANIC ANALYTICAL RESULTS GROUNDWATER SAMPLES AMAX PHOSPHATE FACILITY PALMETTO, MANATEE COUNTY, FLORIDA

	Backgr	round		On Site		Onsite Monitoring Wells					Private Well	Trip Blank
PARAMETERS (ug/l)	AP-TW-01	AP-TW-02	AP-TW-03	AP-TW-04	AP-TW-05	AP-MW-01*	AP-MW-03	AP-MW-04	AP-MW-05	AP-MW-06	AP-PW-01	AP-PB-01
ALUMINUM	36,000	260,000	7300	20,000	5600	3400	750	•	1610	•	•	·
ARSENIC	14	53	18	56	•	-	301	•	•	•	•	
BARIUM	110	460	53	210	130		120	•	52	•	•	
BERYLLIUM	20	6	•			•	•	-	-	•	•	
CADMIUM	3U	3U	•		•	•	18	-		٠		·
CALCIUM	91,000	21,000	600,000	320,000	470,000	81,000	380,000	140,000	270,000	75,000	83,000	
CHROMIUM	78	190	12	38	13	•	•	•	9	•	•	
COBALT	7	32		9	·	•	•	•	•		•	
RON	26,0003	170,000)	27,0001	25,000)	23001	33001	10,0001	1300J	3200J		•	·
LEAD	18	44		12	5	5		•	-	8		
MAGNESIUM	20,000	9300	36,000	25,000	39,000	37,000	16,000	16,000	61,000	22,000	40,000	
MANGANESE	70U	70		39		73	220					·
NICKEL	18	89	•	14	٠	•	·			L		
POTASSIUM	29,000	2900	23,000	8000	30,000	4000	9100	2600	9300	6400	3700	
SODIUM	28,000	2200	7000	120,000	55,000	75,000	350,000	36,000	61,000	29,000	55,000	

- Material analyzed for but not detected above minimum quantitation limit (MQL).
- J Estimated value.
- N Presumptive evidence of presence of material.
- U Material was analyzed for but not detected. The number given is the MQL.
- * AP-MW-02 was not collected.

SUMMARY OF INORGANIC ANALYTICAL RESULTS GROUNDWATER SAMPLES AMAX PHOSPHATE FACILITY PALMETTO, MANATEE COUNTY, FLORIDA

	Backg	round		On Site			Onsite Monitoring Wells					
PARAMETERS (ug/l)	AP-TW-01	AP-TW-02	AP-TW-03	AP-TW-04	AP-TW-05	AP-MW-01*	AP-MW-03	AP-MW-04	AP-MW-05	AP-MW-06	AP-PW-01	AP-PB-01
VANADIUM	74	170	•		130	•	•	•	•	•	•	-
ZINC	60UJ	130J	•	•	٠			•	•	-	•	•

- Material analyzed for but not detected above minimum quantitation limit (MQL).
- J Estimated value.
- N Presumptive evidence of presence of material.
- U Material was analyzed for but not detected. The number given is the MQL.
- * AP-MW-02 was not collected.

SUMMARY OF ORGANIC ANALYTICAL RESULTS SEDIMENT SAMPLES AMAX PHOSPHATE FACILITY PALMETTO, MANATEE COUNTY, FLORIDA

	Backg	round	Southern Drainage Pathway		Norther	n Drainage Path	way	On Site				
PARAMETERS (ug/tg)	AP-SD-01	AP-50-02*	AP-SD-04	AP-SD-05	AP-5D-04	AP-50-07	AP-50-00	AP-SD-09	AP-SD-10	AP-50-11	AP-SD-12	
PURGEABLE COMPOUNDS												
ACETONE	130	310		·	26	•		37			•	
CARBON DISULFIDE	€U	10)	•	•	•		•	•		· · ·		
TRIMETHYLBICYCLOHEPTANE(1)						301N						
WETHYL(METHYLETHYL)BENZENE(1)						200JN						
UNIDENTIFIED COMPOUNDS/NO.(1)						201/1		1				
EXTRACTABLE COMPOUNDS												
BENZOIC ACID	4100U	10,000U			:_	· -		· ·	6901		· · ·	
ACENAPHTHENE	840U	2100U	•		•	140)		· .	· ·		· ·	
PHENANTHRENE	580)	2100U				760)	·		· ·	· ·	· ·	
ANTHRACENE	140)	2100U		750)		1901	·					
DI-N-BUTYLPHTHALATE	840U	2100U	•	•			•			150)		
FLUORANTHENE	1400	2100U	· ·	· _		3200	·		· _			
PYRENE	750)	2100U				1600		•		· .	· ·	
BENZYL BUTYL PHTHALATE	840U	, 2100U		·	·		210)				· ·	
BENZO(A)ANTHRACENE	3301	2100U		1201	·_	4901	•	· ·				
CHRYSENE	5001	2100U		4201		710)						

- Material analyzed for but not detected above minimum quantitation limit (MQL).
- J Estimated value.
- N Presumptive evidence of presence of material.
- U Material was analyzed for but not detected. The number given is the MQL.
- (1) Tentatively identified compound. This compound is not on Target Compound List and is reported only as detected in individual samples; MQL not determined.
- AP-SD-03 was not collected.

SUMMARY OF ORGANIC ANALYTICAL RESULTS SEDIMENT SAMPLES AMAX PHOSPHATE FACILITY PALMETTO, MANATEE COUNTY, FLORIDA

	Backg	round	Southern Drainage Pathway		Northern Drainage Pathway			On Site				
PARAMETERS (ug/kg)	AP-SD-01	AP-SD-02*	AP-SD-04	AP-SD-05	AP-SD-06	AP-SD-07	AP-SD-08	AP-SD-09	AP-SD-10	AP-SD-11	AP-SD-12	
BIS(2-ETHYLHEXYL) PHTHALATE	840U	2100U		·	•	•	•	•	·	·		
BENZO(B AND/OR K)FLUORANTHENE	4401	2100U		2701		470)		·				
BENZO(A)PYRENE	380)	2100U	•	\$101	•	350)	•	•		·		
INDENO (1,2,3-CD) PYRENE	2201	21000	•			140)			·			
BENZO(GHI)PERYLENE	2101	2100U	·									
UNIDENTIFIED COMPOUNDS/NO	3000N3	50,000µ15	1ע000	30001/3		20,0001/5	20,0001/7	2000NS	30,000µ4	50.000µ17	30001/2	
PETROLEUM PRODUCT(1)		N				N				N		
DODECANOIC ACID ⁽¹⁾			<u> </u>		-			1000JN	20,000JN			
HEXADECANOIC ACID(1)	6001N	1000JN				1					1000JN	
ANTHRACENEDIONE(1)	300JN											
BENZOFLUORENE ⁽¹⁾	3001N				<u> </u>	300JN				1		
BENZOFLUORANTHENE(NOT B OR K)(1)	200JN		1		1							
BENZACEPHENANTHRYLENE ⁽¹⁾	500JN		1									
TETRAHYDRODIMETHYL(METHYETHYL)NAPHTHALENE(1)		1				2000JN	500JN				1	
NAPHTHALENOL(1)						1000JN						
HEPTADECANOIC ACID(1)		1	1			500JN	 	400JN				
OCTADECANOIC ACID(1)		T				1		800JN	4000JN			

- Material analyzed for but not detected above minimum quantitation limit (MQL).
- J Estimated value.
- N Presumptive evidence of presence of material.
- U Material was analyzed for but not detected. The number given is the MQL.
- 17 Tentatively identified compound. This compound is not on Target Compound List and is reported only as detected in individual samples; MQL not determined.
- AP-SD-03 was not collected.

SUMMARY OF ORGANIC ANALYTICAL RESULTS SEDIMENT SAMPLES AMAX PHOSPHATE FACILITY PALMETTO, MANATEE COUNTY, FLORIDA

	Backg	Southern Orainage Rackground Pathway		Northern Drainage Pathway		On Site					
PARAMETERS (ug/leg)	AP-SD-01	AP-SD-02*	AP-SD-04	AP-SD-05	AP-SD-06	AP-50-07	AP-SD-00	AP-SD-09	AP-SD-10	AP-SD-11	AP-SD-12
PHENYLETHANONE ⁽¹⁾									30001N		
TETRADECANOIC ACID ⁽¹⁾									700 JN		
PHENYLTRICYCLONODIENOL(1)									SUGOIN		
DIPHENYLPROPANEDIONE ⁽¹⁾									60001N		
PESTICIDEVICE COMPOUNDS 1											
PCB-1248 (AROCLOR 1248)	200U	500U	· _ ·				350		•		

- Material analyzed for but not detected above minimum quantitation limit (MQL).
- Estimated value.
- N Presumptive evidence of presence of material.
- U Material was analyzed for but not detected. The number given is the MQL.
- (1) Tentatively identified compound. This compound is not on Target Compound List and is reported only as detected in individual samples; MQL not determined.
- AP-SD-03 was not collected.

TABLE 10

SUMMARY OF INORGANIC ANALYTICAL RESULTS SEDIMENT SAMPLES AMAX PHOSPHATE FACILITY PALMETTO, MANATEE COUNTY, FLORIDA

•	Southern Drainage Background Pathway Northern Dr				Northern Drainage Pathway				! On!	Site	
PARAMETERS (mg/kg)	AP-SD-01	AP-SD-02°	AP-SD-04	AP-SD-05	AP-SD-06	AP-SD-07	AP-SD-08	AP-SD-09	AP-SD-10	AP-SD-11	AP-5D-12
ALUMINUM	380	10,000	530	1300	1100	1000	950	21,000	4400	300	12,000
BARIUM	2U	80	19	7.5	5.2	13	13	110	72	16	64
CADMIUM	0.71U	1.90	•	-	•		-	2.6			8
CALCIUM	1400	38,000	2000	3100	8400	27,000	7200	200,000	210,000	220,000	110,000
CHROMIUM	1.40	20		2.8	2.4	61	6.6	140	24	71	76
COBALT	0.95U	3U						2.7		3.9	3.4
COPPER	9UJ	62J		•			· ·		-		
IRON	440)	11,000J	8301	1600)	90001	6400J	2100J	45,000J	12,000J	3901	18,000)
LEAD	2.BJ	16J	1.17	74J	1.73	11)	15J	85J	26J	2 1J	591
MAGNESIUM	200	2500	82	1100	170	200	520	2000	510	4500	9900
MANGANESE	2U	63		-	26	22		26	•	44	40
NICKEL	1.4U	6.7			2.3	2.7		•	4.2	17	7.6
POTASSIUM	60U	270U			•	·		2000	550	•	1600
SODIUM	350U	290U		2900			•	12000	3900	2800	6700
VANADIUM	10	200	·					140	24		130

- Material analyzed for but not detected above minimum quantitation limit (MQL).
- J Estimated value.
- N Presumptive evidence of presence of material.
- U Material was analyzed for but not detected. The number given is the MQL.
- * AP-SD-03 was not collected.

SUMMARY OF ORGANIC ANALYTICAL RESULTS SURFACE WATER SAMPLES AMAX PHOSPHATE FACILITY PALMETTO, MANATEE COUNTY, FLORIDA

·	Back g	Background		Northern Orainage Pathway		Southern Drainage Pathway			On Site	
PARAMETERS (ug/l)	AP-SW-01	AP-SW-02*	AP-SW-04	AP-SW-05	AP-SW-06	AP-SW-07	AP-SW-08	AP-SW-09*	AP-SW-11	
PURGEABLE COMPOUNDS										
CARBON DISULFIDE	SU	SU	-		5			-	4)	
TETRAMETHYLBUTANE(1)									8JN	
EXTRACTABLE COMPOUNDS										
UNIDENTIFIED COMPOUNDS/NO.(1)					1003/3			60)/4		
BROMACIL ⁽¹⁾			4JN				4JN			
HEXADECANOIC ACID(1)								10JN	10JN	
HYDROXYMETHOXY BENZALDEHYDE(1)								5JN		
PETROLEUM PRODUCT(1)			1				1	N		
TETRADECANOIC ACID(1)			<u> </u>		1				7JN	

- Material analyzed for but not detected above minimum quantitation limit (MQL).
- J Estimated value.
- N Presumptive evidence of presence of material.
- U Material was analyzed for but not detected. The number given is the MQL.
- (1) Tentatively identified compound. This compound is not on Target Compound List and is reported only as detected in individual samples; MQL not determined.
- AP-SW-03 and AP-SW-10 were not collected.

TABLE 12

SUMMARY OF INORGANIC ANALYTICAL RESULTS SURFACE WATER SAMPLES AMAX PHOSPHATE FACILITY PALMETTO, MANATEE COUNTY, FLORIDA

	Backg	Background		Northern Drainage Pathway		rn Drainage Patl	l On Site		
PARAMETERS (ug/l)	AP-SW-01	AP-SW-02*	AP-SW-04	AP-SW-05	AP-SW-06	AP-SW-07	AP-SW-08	AP-SW-09*	AP-SW-11
ALUMINUM	340U	16,000	·	•		·	•	27,000	•
ARSENIC	50	80	•	-	•		•		49
BARIUM	20U	120	•	29	•		•	63	•
BERYLLIUM	10	10	•		•		-	23	-
CADMIUM	3U	3∪	•	•				130	•
CALCIUM	61,000	170,000	160,000	160,000	150,000	180,000	160,000	670,000	170,000
CHROMIUM	6U	28	•	•	•	•	•	360	•
COBALT	4U	4U	•	•			•	210	
IRON	350UJ	14,000J	•	•	•	•	•	29,0001	-
LEAD	5	14		•	•	•	•	35	-
MAGNESIUM	140,000	46,000	58,000	220,000	66,000	59,000	42,000	200,000	49,000
MANGANESE	20U	110	•			•	52	4100	
NICKEL	6U	8U	•	•			-	690	
POTASSIUM	47,000	13,000	16,000	68,000	3700	5300	6800	160,000	89,000
SODIUM	1,100,000	68,000	110,000	1,500,000	42,000	100,000	69,000	1,200,000	650,000
THALLIUM	10UR	10UR					•	13)	
VANADIUM	4U	30U						820	1

- Material analyzed for but not detected above minimum quantitation limit (MQL).
- J Estimated value.
- N Presumptive evidence of presence of material.
- U Material was analyzed for but not detected. The number given is the MQL.
- R Quality Control indicates that data is unusable. Compound may or may not be present.
- * AP-SW-03 and AP-SW-10 were not collected.

SUMMARY OF INORGANIC ANALYTICAL RESULTS SURFACE WATER SAMPLES AMAX PHOSPHATE FACILITY PALMETTO, MANATEE COUNTY, FLORIDA

	Backg	round	Northern Drainage Pathway		Southern Drainage Pathway			On Site	
PARAMETERS (ug/l)	AP-SW-01	AP-SW-02*	AP-SW-04	AP-SW-05	AP-SW-06	AP-SW-07	AP-SW-08	,AP-SW-09*	AP-SW-11
ZINC	40UJ	130UJ		•	•		•	1400)	•
CYANIDE	100	10U	•		•	14	100	•	•

- Material analyzed for but not detected above minimum quantitation limit (MQL).
- Estimated value.
- N Presumptive evidence of presence of material.
- U Material was analyzed for but not detected. The number given is the MQL.
- R Quality Control indicates that data is unusable. Compound may or may not be present.
- * AP-SW-03 and AP-SW-10 were not collected.

TABLE 13

SUMMARY OF RADIONUCLIDE CONCENTRATIONS IN SOIL SAMPLES

AMAX PHOSPHATE FACILITY

PALMETTO, MANATEE COUNTY, FLORIDA

Parameters (pCi/g)(1)	Background	On Site	Gypsum	Background	Northern	Southern
	AP-SS-01	AP-SS-06	AP-SS-07	AP-SD-01	AP-SD-06	AP-SD-12
Radium-226	0.89 ±	8.12 ±	16.5 ±	0.36 ±	0.76 ±	7.36 ±
	5.00%	1.00%	1.0%	7.00%	5.00%	1.00%
Radium-228	0.56 ±	0.49 ±	8.10 ±	0.85 ±	0.38 ±	0.73 ±
	153%	186%	17.0%	115%	256%	128%

⁽¹⁾ Results are for dry soil.

TABLE 14

SUMMARY OF RADIONUCLIDE CONCENTRATIONS IN WATER SAMPLES

AMAX PHOSPHATE FACILITY

PALMETTO, MANATEE COUNTY, FLORIDA

	Background	Monito	ring Wells	Background	Southern Drainage
Parameters (pCi/l)	AP-TW-01	AP-MW-03	AP-MW-06	AP-SW-01	AP-SD-12
Radium-226	7.32 ±	16.4 ±	1.13 ±	0.54 ±	1.85 ±
	2.00%	1.00%	3.00%	4.00%	2.00%
Radium-228	2.43 ±	1.76 ±	0.53 ±	0.53 ±	0.29 ±
	87.5%	64.6%	81.0%	85.8%	182%
Gross Alpha	53.8 ±	44.6 ±	1.75 ±	5.04 ±	5.30 ±
	21.6%	42.4%	169%	235%	83.3%

background); cadmium (3, 5, and 3 times MQL); chromium (3, 5, and 6 times background); and vanadium (7, 10, and 8 times MQL) were detected in all three samples. Nickel (3 and 5 times MQL) was found in two soil samples (AP-SS-03 and AP-SS-05), while manganese (4 times background) was detected in one (4 times background). The only contaminant of concern present in elevated quantities in the fourth onsite sample (AP-SS-04) was selenium (10 times MQL, estimated). There were no inorganics of concern found in elevated quantities in subsurface soil samples.

The only metals of concern detected in elevated quantities in groundwater were cadmium (6 times MQL) and manganese (3 times MQL) from AP-MW-03. This monitoring well is located in the center of the facility between the chemical plant and gypsum stacks. The EPA maximum contaminant level (MCL) for primary drinking water standards for manganese (50 ug/l) was exceeded in this sample (Ref. 26). Although arsenic was detected in levels less than 3 times background, its concentration (56 ug/l) in the sample from AP-TW-04, collected east of the chemical plant, exceeded the MCL (50 ug/l). With samples ranging in concentration from 1,300 to 27,000 ug/l, the secondary MCL (300 ug/l) for iron was also exceeded in seven of the onsite groundwater samples.

The only sediment samples with large quantities of inorganics of concern were collected from the cooling pond (AP-SD-09) and drainage ditch adjacent to the gypsum stacks (AP-SD-12). Both had chromium (7 and 3 times MQL), lead (5 and 4 times background estimated), and vanadium (7 and 6 times MQL). As with the sediment samples, onsite surface water samples were the only ones with elevated quantities of contamination. The surface water sample from the cooling pond contained cadmium (6 times MQL), chromium (13 times MQL), lead (3 times background), manganese (37 times background), nickel (86 times background), and vanadium (27 times MQL). Cyanide (10 times MQL) was also found in one offsite sample collected on the northern drainage pathway, but it is not site related. Since there were no inorganics of concern detected in elevated amounts in either offsite sediment or surface water samples, it can be assumed that these contaminants are not migrating from the facility along the surface water migration pathway.

Radium-226, radium-228, and gross alpha analyses were performed on select soil, sediment, groundwater, and surface water samples. The radium-226 and radium-228 analyses for the sample (AP-SS-07) were 18.5 and 14.5 times background respectively; while the onsite soil sample was 9.1 times background for radium-226, but not elevated for radium-228. The sediment sample collected from the northern drainage ditch (AP-SD-06) was slightly elevated (2 times background) for radium-226 and beneath background values for radium-228. Radium-226 was more elevated (10 times background) in the sediment collected in the southern drainage ditch (AP-SD-12). Although there are no specific criteria for radium deposition, the National Council on Radiation Protection and Measurements (NCRP) has recommended a guide of 40 picocuries of radium-226 per gram of soil as a

concentration to be evaluated for agricultural land use (Ref. 27). All of these values are beneath that quantity.

The gross alpha particle activity for two groundwater samples (AP-TW-01, AP-MW-03) was above the maximum contaminant level (MCL) for primary drinking water standards (15 pCi/l). The sample collected from a surficial aquifer monitoring well (AP-MW-03) was 44.6 pCi/l. This value was slightly lower than the background (53.8 pCi/l) which was above the MCL. The amount of radium-226 in this monitoring well sample (AP-MW-03) was also slightly elevated (2.2 times background). Both groundwater samples (AP-TW-01, AP-MW-03) exceeded the combined radium-226, radium-228 MCL (5 pCi/l) for primary drinking water standards with combined values of 9.75 and 18.2 pCi/l, respectively. Radionuclide analyses were not elevated in the third groundwater sample. The only elevated quantity in surface water was for radium-226 (3.4 times background) in the sample collected from the southern drainage pathway (AP-SW-06).

5.0 SUMMARY

All three contaminant pathways, surface water, groundwater, contact, and air, are of concern for AMAX Phosphate. Surface water run-off from the facility is channeled by way of two drainage ditches into either Bishop Harbor then Tampa Bay, or Piney Point Creek and then Tampa Bay. Fishing, boating, and bathing occur along the surface water migration pathway. Additionally, the area is surrounded by wetlands which drain toward the north into the Little Manatee River. This river is a critical habitat for the Florida manatee (<u>Trichechus manatus</u>), which is often sighted in the river. There are also other federally and state-protected or endangered species with ranges in the area. Furthermore, the facility is located in a flood plain, making migration of contaminants more likely during wet weather.

Since many people within the 4-mile radius obtain potable water from shallow wells, groundwater contamination may pose a serious potential threat. Water for irrigation is also obtained from wells in Manatee County. Additionally, the area is characterized by karst terrain containing sinkholes and underground cavities.

Gases from the site make airborne contamination a potential threat. Emission of phosphorous and sulfur oxides from the stacks pose a potential problem with air contamination. Because of the acidity of the process waters, the small amount of fluorides in the gypsum are converted to hydrogen fluoride. In fact, fluorides that probably originate from hydrogen fluoride are often found during the analysis of grass and foliage. Airborne contamination was evident from the stressed vegetation surrounding the plant. This could affect the residents and cattle in the area also.

Since the gypsum stacks are in the open, and process water is evident throughout the facility, contamination from contact could pose a potential threat to onsite employees. As the facility is not fenced along the southern border, access can be attained by foot.

During this sampling investigation, 44 environmental samples were collected. These include soil, groundwater, sediment, and surface water samples. The only organic pollutants of concern detected in elevated quantities in soil were toluene and carbon disulfide. Carbon disulfide, a by-product in the sulfuric acid manufacturing process, was also found in one groundwater sample collected from an onsite monitoring well. There were no organic compounds of concern that are associated with the processes at the plant found in either sediment or surface water samples.

In order to characterize the inorganic constituents in gypsum, a sample of newly deposited material was analyzed. It contained the following metals: aluminum, barium, calcium, chromium, iron, lead, magnesium, manganese, nickel, sodium, and vanadium. Those inorganics of concern detected in elevated quantities in soil samples, and also found in the gypsum, were barium, cadmium, chromium, manganese, nickel, selenium, and vanadium. Only cadmium and manganese were detected in elevated quantities in one onsite groundwater sample. The primary EPA maximum contaminant level (MCL) for drinking water standards was exceeded for manganese in this sample. Although the quantity of arsenic was not elevated, the MCL was exceeded in one groundwater sample collected on site. Additionally the secondary MCL in drinking water for iron (300 ug/l) was exceeded in seven of the onsite groundwater samples.

Chromium, lead, and vanadium were detected in elevated quantities in a sediment sample collected on site from the drainage ditch, while the only surface water sample containing elevated amounts of inorganics, including cadmium, chromium, lead, manganese, nickel, and vanadium, was taken from the cooling pond. There was no evidence of migration of these contaminants along the surface water pathway from this study.

Analysis for radioactive nuclides in soil samples revealed that the onsite soil sample contained an elevated amount of radium-226 but not radium-228. Also, the amount of this nuclide in the southern drainage pathway was more elevated than in the northern drainage pathway (10 times versus 2 times background). Values of radium-226 and radium-228 were 18.5 and 14.5 times background, respectively, for the gypsum sample. However, none of these values exceeded the National Council on Radiation Protection and Measurements maximum criteria for radium-226 deposition on agricultural land (40 pCi/g). For groundwater samples, the MCL for primary drinking water standards was exceeded for gross alpha particle activity (915 pCi/l) for the background and one onsite surficial aquifer monitoring well sample. Additionally, the combined radium-226, radium-228 MCL (5 pCi/l) was also exceeded for these two samples. This value for radium-226 was exceeded for the surface water sample collected in the southern drainage pathway too; however, this is not a potable source. Unlike the organic and inorganic results, the elevated radium-226 values for the surface water and sediment samples collected in the southern drainage pathway indicate migration of this nuclide from AMAX along the surface water pathway.

Because of the targets associated with the four contaminant pathways and the elevated quantities of contaminants found at AMAX Phosphate, FIT 4 recommends that this site be evaluated using the HRS (effective March 14, 1991).

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REFERENCE 3

GROUND-WATER RESOURCE AVAILABILITY INVENTORY:

MANATEE COUNTY, FLORIDA



SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT MARCH 1988



GROUND-WATER RESOURCE AVAILABILITY INVENTORY: MANATEE COUNTY, FLORIDA

PREPARED BY: RESOURCE MANAGEMENT AND PLANNING DEPARTMENTS OF THE SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

MARCH 1988

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

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composed of carbonate deposits (usually dolomitic) that contain varying amounts of interbedded quartz sand, clay, and phosphate. The middle section consists of interbedded sandy carbonate, clayey sand, and sandy clay. The upper Hawthorn section is predominantly composed of clastic deposits that consist of quartz, phosphate sand and pebbles, and light green to a moderately dark gray clay (Hall, 1983). The trifold subdivision of the Hawthorn Formation is most apparent in the south. Elsewhere, one or two of these units may be absent, or the upper unit may lie directly over the lowermost unit. In the north, the units become less distinctive and merge to a single unit where a sandy phosphatic clay perdominates, or the Formation is absent. The thickness of the entire Hawthorn Formation varies from thin to absent in the northern areas of the SWCFGWB to greater than 600 feet in the southern areas.

Oligocene - The only formation of this epoch is the Suwannee Limestone. It is composed of hard, yellow or creamy fossiliferous limestone, which locally has an orange tinge. Interbeds may contain quartz sand, and dolomite is common toward the unit's base from the Tampa Bay area southward. The upper part may contain thin chert lenses and be highly macrofossiliferous. The Suwannee is exposed in parts of Pasco County, and in the northeast corner of Hillsborough County, and pinches out in Polk County. The Suwannee is as much as 300 feet thick in the southern areas of the SWCFGWB.

Eocene Epoch - The Eocene formations within the SWCFGWB consist of the Ocala Limestone, Avon Park Formation, and Oldsmar Formation, in descending order. The Ocala Limestone consists of three units. In descending order these units are the Crystal River, Williston, and Inglis. All three units generally consists of a coquinic foraminiferal limestone, usually cream to white in color. The Inglis Member frequently contains gray to brown dolomite, and chert layers that can be present throughout the entire Ocala Limestone. The Ocala Limestone outcrops in northern Polk and southern Sumter Counties within the Green Swamp area (Pride and others, 1966). The Ocala ranges in thickness from less than 300 feet in the northern areas of the SWCFGWB to greater than 600 feet in thickness in the southern areas.

The Ocala is unconformably underlain; by the middle Eocene Avon Park Formation. Lithologically, the Avon Park is composed of fossililferous limestone and dolostone. The limestone is moderate brown, dark-yellow brown to rusty-yellow brown, porous and very fine to medium grained and may be crystalline or saccharoidal in texture. The top of the Avon Park may contain peat or carbonaceous layers and the bottom may contain small lenses of evaporite. The Avon Park Formation thickens to greater than 1,000 feet in the SWCFGWB. The Avon Park is the deepest potable water bearing formation in the SWCFGWB, therefore, older geologic formations will not be discussed at the sweet of the s

KARST ACTIVITY

Florida's landscape, including the SWCFGWB, is dominated by features of karst topography. Karst topography develops where rainfall drains internally and rocks are susceptible to solution (Ritter, 1979). In these areas, the solution process can create and enlarge cavities within the rocks and allow underground circulation of water which, in turn, promotes further solution. This leads to

e:f.

TABLE 3: Major springs and flow in the Southern West-Central Florida Ground-Water Basin (from Roseneau and others, 1977).

INDEX	SPRINGS	DISCHG (CFS)	INDEX	SPRINGS	DISCHG (CFS)
1	SALT	9.5	7 ·	SIX MILE CREE	K 1.5
2	CRYSTAL	6.0	8	BUCKHORN	15.5
3	HEALTH	6.5	9	LITHIA	51
4	SULPHUR	44	10	KISSENGEN	9.5
5	LETTUCE LAK	E 9.5	11	WARM MINERAL	1
6	EUREKA	-1.5	12	UNNAMED	30

GROUND WATER

Surficial Acuifer System

A distinct surficial aquifer system exists throughout nearly all of the SWCFGWB and consists of marine and non-marine quartz sand, clayey sand, shell, shelly marl, and phosphorite, with occasional stringers of marl and limestone. The surficial system extends from land surface to the top of the upper confining bed of the Caloosahatchee Marl, Bone Valley Formation, Tamiami Formation, or Hawthorn Formation, whichever is first stratigraphically Water in the surficial aguifer system is generally encountered. unconfined; however, locally within the aquifer system are weak semi-confined layers that poorly confine the ground water. Average thickness of the aquifer is about 25 feet, but ranges from a foot or less, where limestone or clay outcrop or are near land surface, to several hundred feet beneath the Highland Ridge (Figure 13). Extreme thicknesses of 300 to 600 feet or more have been reported along the eastern side of the Lake Wales Ridge in Polk County (Stewart, 1966).

Surficial Aquifer Hydraulic Properties

Hydraulic properties of the surficial aquifer system in the SWCFGWB vary widely due to variation in types of material that comprise the aquifer; its physical characteristics, such as grain size and sorting; and thickness of the saturated zone. Hydraulic properties for the surficial aquifer system are listed in Table 4. The locations of the aquifer test sites at which these values were derived are given in Figure 19.

Transmissivity of the surficial aquifer system ranges from about 20 feet squared per day (ft^2/d) where fine clayey sand predominates, to greater than 5,000 ft²/d in some clean shell beds in the southern areas of the SWCFGWB. Transmissivities are lowest to the north and along the coast where the aquifer is composed of mostly fine grained clastics, and saturated thickness is least. Transmissivities are greatest in southern Sarasota, Charlotte, and Lee Counties.

Specific yield of the surficial aquifer ranges from 0.05 to 0.3 (Wilson and Gerhart, 1980). Determinations of vertical hydraulic conductivity have been made from lab tests on undisturbed samples, range from 0.12 x 10^{-5} to 13 feet per day (ft/d) (Sinclair, 1974; Hutchinson and Stewart, 1978; Healy and Hunn, 1984). Determinations of horizontal hydraulic conductivity range from 0.0028 ft/d to greater than 1,000 ft/d (Healy and Hunn, 1984).

III. MANATEE COUNTY OVERVIEW

Geographic Setting, Physiography - Topography, and Drainage

Manatee County is located on the west-central coast of Florida and fronts on Tampa Bay at its southern-most point. Manatee County is bounded by Hillsborough County on the north, Hardee and DeSotc Counties to the east, Sarasota County on the south, and the Gulf of Mexico and Tampa Bay to the west (Figure 53). Manatee County contains about 739 square miles of land area and 46 square miles of inland surface-water area. Land surface altitudes range from sea level along the coast to about 135 feet above NGVD in the northeast (Figure 54).

The physiographic provinces of Manatee County were described by White (1970). These provinces are the Gulf Coastal Lowlands, the DeSoto Plain, and the Polk Upland (Figure 6). The ancient stands of sea level above its present level during Pleistocene time shaped the topography into marine terraces across the county. The Pamlico Terrace, generally less than 20 feet above NGVD, and the Talbot Terrace, about 40 feet above NGVD, form the relatively flat, poorly drained Gulf Coastal Lowlands. The Penholoway Terrace, about 60 to 70 feet above NGVD and the Wicomaco Terrace, about 90 to 100 feet above NGVD, make up the DeSoto Plain. The highest and oldest surface is the Sunderland Terrace that formed when the sea was 170 feet above the present level. The Polk Upland physiographic unit was formed by the Sunderland Terrace. Recent stream and river erosion have modified these terraces but large areas of relatively flat land remain where the drainage is poor.

Principal surface-water drainage for the county is through the Manatee, Little Manatee, Myakka Rivers, and their tributaries. Many coastal streams drain directly into the Gulf of Mexico. The large flatland areas of the county are poorly drained and contain many small, shallow lakes and swamps. A canal network has been dug throughout the county to augment natural drainage (Brown, 1983).

Climate

The climate of Manatee County is humid and sub-tropical, characterized by high mean annual rainfall and temperature. Warm humid summers and mild winters are the result of the low latitude and the stabilizing affect of the Gulf of Mexico and the Atlantic Ocean.

Data collected by the National Weather Service indicate that the mean annual air temperature in the county is about 72°F, and mean monthly temperatures range from 60°F in winter to 80°F in summer. Summer temperatures usually peak in the low to mid-90's but are moderated by frequent afternoon convectional thundershowers. Winter temperatures vary the most during late winter when cold fronts bring arctic air from the northwest. These fronts may bring minimal temperatures below freezing but day light temperatures rarely reach freezing levels. Cold weather generally lasts only two to three days and are separated by warm days (Wolf and others, 1986). Average low temperatures are near 50°F during the coldest months (December, January, and February).

Lessor amounts of water are withdrawn from the surficial and intermediate aquifer systems and are used primarily for domestic supply, with other uses including stock watering, agricultural irrigation, and small public supplies. Most irrigation wells that penetrate the Floridan aquifer are also open to the intermediate system.

Surficial Aquifer System(*)

In Manatee County, the surficial aquifer system is composed primarily of deposits of sand, gravel, shells, and limestone whose composition may vary laterally and vertically. The deposits comprise the Pliocene to Recent age undifferentiated sands, terrace deposits, and the Bone Valley Formation. In the eastern and central part of Manatee County, the aquifer consists mostly of medium to fine-grained, well-sorted, quartz sand and ranges in thickness from about 10 to 90 feet (Figure 65). Within this area, the sands contain a hardpan layer that consists of sand and carbonaceous and limonitic material that averages about 5 feet in thickness. hardpan retards vertical flow of water. The sandy clays of the Bone Valley and Hawthorn Formations form the base of the surficial system in eastern Manatee County. In the western part of the county, the system consists of sand, sandy limestone, and shell and ranges from about 1 to 20 feet in thickness. The sandy clays, clays, and marls form the base of the surficial system. A listing of aquifer coefficients derived from aquifer tests of the surficial aquifer system in the SWCFGWB are included in Table 3. Locations of these tests are given in Figure 19. Seasonal fluctuations in the water table are generally less than 5 feet and are generally lowest in April or May and highest in September.

The direction of ground-water flow in the water table is generally west and south in Manatee County. The configuration of the water surface is similar to that of the land surface. Water surface is at sea level along the coast and increases to altitudes of about 130 feet above NGVD in the northeast area of the county. Depth to the water table ranges from zero in coastal and flat, poorly drained areas, to about 10 feet below land surface in topographically high areas. The average depth to the water table is about 5 feet.

In some areas, the surficial aquifer is confined by layers of hardpan, clay, or limestone. Many shallow wells in the county penetrate one or more of these confining layers. Generally, the artesian pressure is insufficient to produce flowing wells (Peek, 1958b). The surficial aquifer supplies the least quantity of water in the county. Small volumes of water are used for domestic use, lawn irrigation, or stock watering. Most wells that tap the surficial aquifer have small diameters and yield less than 50 GPM. Most surficial wells are finished as open holes; some are screened.

Acuifer Properties

The transmissivity of the surficial aquifer in Manatee County ranges from less than 267 to about 5,304 $\rm ft^2/d$ (Table 3). The transmissivity of the thick sand and phosphorite deposits in the southcentral part of the county probably ranges from about 1,000 to 2,000 $\rm ft^2/d$ (Brown, 1983). Similar transmissivity was reported by Wilson (1972) and Hutchinson and Wilson (1977a) for surficial deposits in

DeSoto and Hardee Counties. Transmissivity of the surficial aquife in Charlotte County south of Manatee County, that consists of san and interbedded shell and limestone similar to deposits in wester Manatee County, was reported to be about 7,000 $\rm ft^2/d$ (Sutcliffe 1975).

The storage coefficient of an unconfined aquifer is virtually equa to the specific yield, which is commonly determined by laborator drainage tests. In Manatee County, the storage coefficient of th surficial aquifer is 0.05 to 0.12 (Table 3). Similar estimates o storage coefficients based on laboratory specific-yield tests o similar deposits in Polk County (Pride and others, 1966) and i: Hillsborough County (Sinclair, 1974) and on an aquifer test is southeastern Hillsborough County (Hutchinson, 1978).

Water Quality (*)

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The chemical quality of ground water is primarily affected by the quality of rainfall that recharges to the aquifer, types of rocks in which water is in contact, and length of time water has been circulating within the aquifers. In Manatee County, the chemical quality is also affected by intrusion of seawater or the mixing of relatively fresh water with highly mineralized water, believed to be residual seawater within the water-bearing formations (Peek, 1958a).

Wells that penetrate deep water-bearing zones are commonly constructed with tens to hundreds of feet of open hole and are open to one or more water-bearing zones. Water in each zone has distinctive water-quality characteristics. Thus, the quality of water pumped depends on which zones are tapped and the proportion of water derived from each.

The dissolved mineral content of water from the surficial system in Manatee County varies greatly. Water is generally of potable quality except near the coast and tidally affected streams where saltwater intrusion has taken place.

In northeastern Manatee County, the surficial system is composed of relatively insoluble, quartz sand resulting in water that is low in mineral content and hardness (Figure 66). Dissolved solids concentrations are usually less than 300 mg/L. Concentrations of chloride and sulfate are also low, usually less than 10 mg/L and 5 mg/L, respectively. Most water that is soft and low in mineral content has a relatively low pH.

Near the coast and tidally affected streams, water in the surficial system has concentrations of dissolved solids and chlorides of more than 200 and 50 mg/L, respectively. Concentrations of sulfate vary considerably, but are usually less than 20 mg/L. In many places along the coast, water in the surficial system is highly mineralized, approaching that of seawater. In some low-lying and coastal areas, the surficial system is highly mineralized because of infiltration or intrusion by seawater, leakage from improperly constructed wells, uncapped flowing wells, and irrigation water from wells that contain moderate to highly mineralized water (Joyner and Sutcliffe, 1976). Appendix D and E lists the water quality sampling sites and data utilized to modify and update the water quality maps for Manatee County.

Aguifer Properties (*)

The transmissivity of the Floridan aquifer system ranges from about 4,900 to 160,000 ft 2 /d (Table 3). Transmissivity of the dolomite unit of the Avon Park Limestone lower water-bearing zone ranges from about 20,000 to 700,000 ft 2 /d. Most production wells, however, are also open to the lower part of the middle zone (Ocala Limestone). In eastern and southeastern Manatee County, the transmissivity of this zone ranges from 60,000 to 150,000 ft 2 /d (Brown, 1983). In western Manatee County, the transmissivity of the upper and middle zones is about 15,000 ft 2 /d (Peek, 1958a). In northeastern Manatee County, Guyton and Associates (1976) reported an estimated transmissivity of about 3,300 ft 2 /d for the Suwannee Limestone and also indicated that little water can be produced from the Tampa Limestone.

The storage coefficients of most confined aquifers range from about 10^{-5} to 10^{-3} and are about 10^{-6} per foot of thickness (Lohman, 1972). The storage coefficient of the Upper Floridan aquifer in Manatee County ranges from 0.0002 to 0.002 (Table 3). Leakance from the surficial aquifer system to the Upper Floridan aquifer where differences in head are favorable could not be determined accurately from aquifer tests. This was due to (1) extreme thickness of the upper confining beds (about 200 to 400 feet), (2) small drawdowns due to high transmissivity of the aquifer, (3) large fluctuations in background water levels due to seasonal irrigation, and (4) short duration of most aquifer tests (less than 30 days). Leakance to the Upper Floridan aquifer is probably less than 10^{-4} (ft/d)/ft and is estimated to range from 0.00004 to 0.0027 (ft/d)/ft. Estimated leakances determined from aquifer tests range from 10^{-6} to 10^{-3} (ft/d)/ft. In northeastern Manatee County, William F. Guyton and Associates (1976) estimated leakance to be about 1.34×10^{-6} to 1.34×10^{-6} (ft/d)/ft.

Water Ouality(*)

Water in the Upper Floridan aquifer is generally more mineralized than water from the surficial and intermediate aquifer systems. Mineral content of the water within the aquifer varies vertically and areally. Mineral content of the water generally increases with depth of the aquifer penetrated. Water from wells open to the upper water-bearing zone is generally less mineralized than water from wells open to the middle water-bearing zones. Water from wells open to the lower water-bearing zone or to the full thickness of the aquifer has the highest mineralization.

Dissolved Solids.—Concentrations of dissolved solids in water from the Upper Floridan aquifer range from about 300 to more than 2,500 mg/L in the three major water-bearing zones. Concentrations generally increase with depth and laterally from the northeastern part of the county towards the west and south. Dissolved solids in water from wells penetrating the upper zone exceed 500 mg/L in the western and southern parts of the county (Figure 68a).

Water from wells penetrating the middle zone has dissolved solids concentrations ranging from about 300 to 1,800 mg/L (Figure 68b). In northeastern Manatee County, dissolved solids are less than 500 mg/L, and in the western and southeastern parts of the county,

subdued. Figure 5 illustrates east-west and north-south trenicross-sections that depict the topography in the SWCFGWB. Figure illustrates the physiographic regions of the SWCFGWB.

The dominant river basins, ranked in descending stream flow cristare the Peace, Hillsborough, Alafia, Shell Creek, Myakka, Horn Creek, and Manatee Rivers. All of these rivers have an average freater than 100 cubic feet per second (cfs). The major river begin on the Polk Upland and flow west or southwest to the Gulf of Mexico. The major wetland is the Green Swamp but many of the river flood plains are low, wetland strands.

There are numerous second and third magnitude springs in the northern area of the SWCFGWB but south of central Hillsborough are Polk almost no springs exist today. The only three springs reported are Pinehurst, Little Salt, and Warm Mineral Springs, which are allocated in Sarasota County. The latter two springs exceed potable standards for salts concentration. Virtually all springflow is derived from the Floridan aquifer system.

The geology, topography, and drainage are all interdependent with water erosion shaping the limestone chemically and mechanically. The karst nature of the limestone results in solution features redirecting runoff underground. The sand and soft limestone supporting the flat to hilly topography was first shaped by beam erosion terracing the sand and stone. Afterwards, weak limestone caverns collapsed and surface erosion reshaped the highland sands. The southern plains and lowlands lack the underground drainage and typical karst topography. Surficial erosion by rivers and transgressive/regressive seas dominate the land forms. Nutrients and fresh water entering the Gulf also supports a large estuary system along the coast.

The SWCFGWB is characterized by karst terrain, in the northern and eastern areas, developed through the dissolution of the underlying shallow sinkholes. Surface drainage is absent or poorly developed in most of these areas, but waters from Hillsborough, Anclote, and Pithlachascotee Rivers flow through well-defined stream channels. Thick clay layers of the Bone Valley, Caloosahatchee, and Hawthorn Formations subdue karst activity in the flat lands of the central and southern SWCFGWB.

CLIMATE

The climate of the SWCFGWB is characterized by long, warm, humid summers and short, mild winters. Average monthly temperatures range from 61° F in January to 82° F in July and August (National Oceanic and Atmospheric Administration (NOAA), 1986). Average annual temperature is 73° F.

Some rainfall normally occurs during each month, but a SWCFGWB high rainfall season extends from June through September and a low rainfall season extends from October through May. The winter rainfall is relatively light because west-central Florida is south of the normal southern limit of winter frontal systems. About sixty percent of the annual rainfall occurs during the rainy season and is derived principally from convectional storms. The Weather Bureau Stations at St. Leo, Bartow, and Punta Gorda were chosen to

represent the SWCFGWB. Figure 7 shows the historic median and mean monthly rainfall. Figure 8 depicts the annual total rainfall record for these three weather stations in the SWCFGWB. Spatially, summer rainfall is highly variable; areas only a few miles apart often receive widely differing amounts of rain.

Estimates of evapotranspiration (ET) within the SWCFGWB vary; however, approximately 39 inches per year is generally accepted. Close to sixty percent of the total ET occurs in the six month period from May to October (SWFWMD, 1978). The highest ET rates occur in May and June.

GEOLOGY OF THE BASIN

Overview

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The SWCFGWB is underlain by a thick sequence of Cretaceous and Tertiary carbonate rocks overlain by a wedge-shaped sequence of interbedded carbonate and clastic deposits. The principal hydrogeologic units are the surficial, intermediate, and Floridan aquifer systems, as described by the Ad Hoc Committee on Florida Hydrostratigraphic Unit Definition, 1984. The upper one to two thousand feet of the limestones and dolomites that comprise the Floridan aquifer system are considered the Upper Floridan aquifer (Miller, 1982). Table 1 contains the lithologic characteristics and water supply properties of the potable water bearing deposits in the SWCFGWB. Figures 9 and 10 is a hydrogeologic cross-section and a surficial geologic map of the SWCFGWB, respectively.

The Upper Floridan aquifer is a solution-riddled and faulted limestone comprised of chemically precipated limestones and dolomites that contain shells and shell fragments of marine origin. system was deposited throughout the Tertiary period. This aquifer system is the principal storage and water conveying component of the hydrologic system in the SWCFGWB. The carbonate units that are hydrologically significant, in ascending order include the Avon Park Formation, Ocala Limestone, Suwannee Limestone, Tampa Limestone, and portions of the Hawthorn Formation that are in hydrologic connection with underlying units. These units range in age from Eocene to Miocene. The Tampa Limestone of Miocene Age is generally thin to absent throughout the northern and eastern areas of the SWCFGWB. the SWCFGWB the Upper Floridan aquifer may contain one or more inter-aquifer confining beds which, in turn, produce a multi-aquifer system. The system thickens from less than 800 feet in the north to greater than 2200 feet in the south (Figure 11).

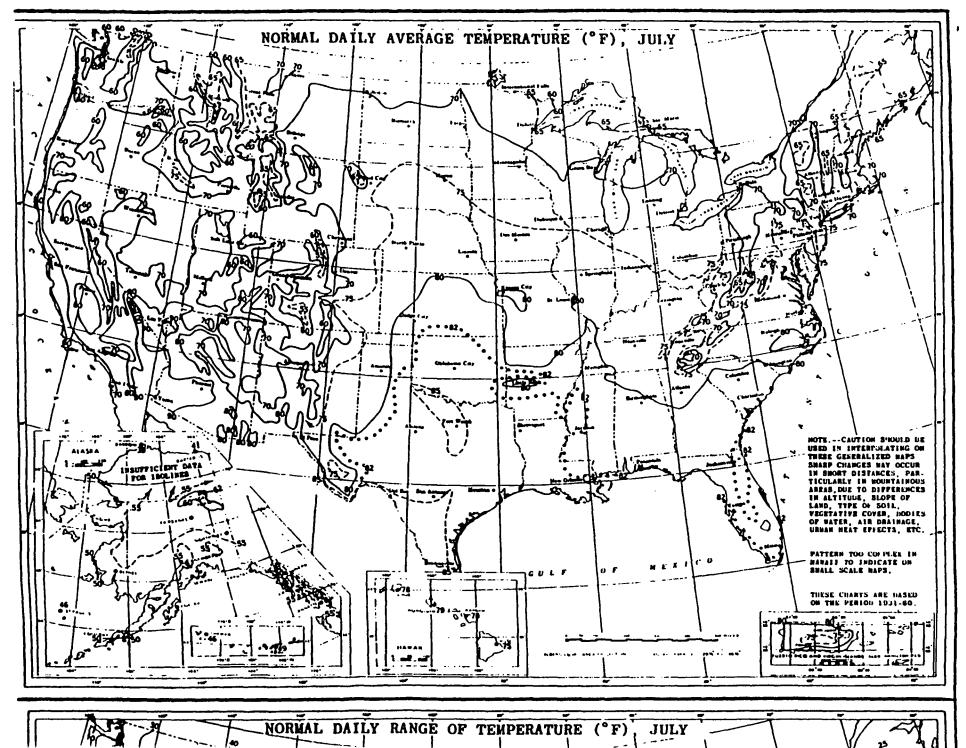
Early in the Miocene Epoch, terrestrial deposits were carried by rivers from the north and intermixed with the upper Tertiary deposits. Clastic deposition continued through the Pliocene and Pleistocene Epochs with phosphatic enrichment of clastic sediments becoming more pronounced. The Hawthorn Formation of Miocene age and the Caloosahatchee, Tamiami, and Bone Valley Formations of Pliocene and Pleistocene age predominately comprise the intermediate aquifer system. In areas of Polk, Manatee, Hardee, DeSoto, Sarasota, and Charlotte Counties, sand and clay beds within the Tampa Limestone are hydraulically connected to the overlying units and are also included in the intermediate aquifer system (Corral and Wolansky, 1984). Units of the intermediate system consist of sand, gravel,

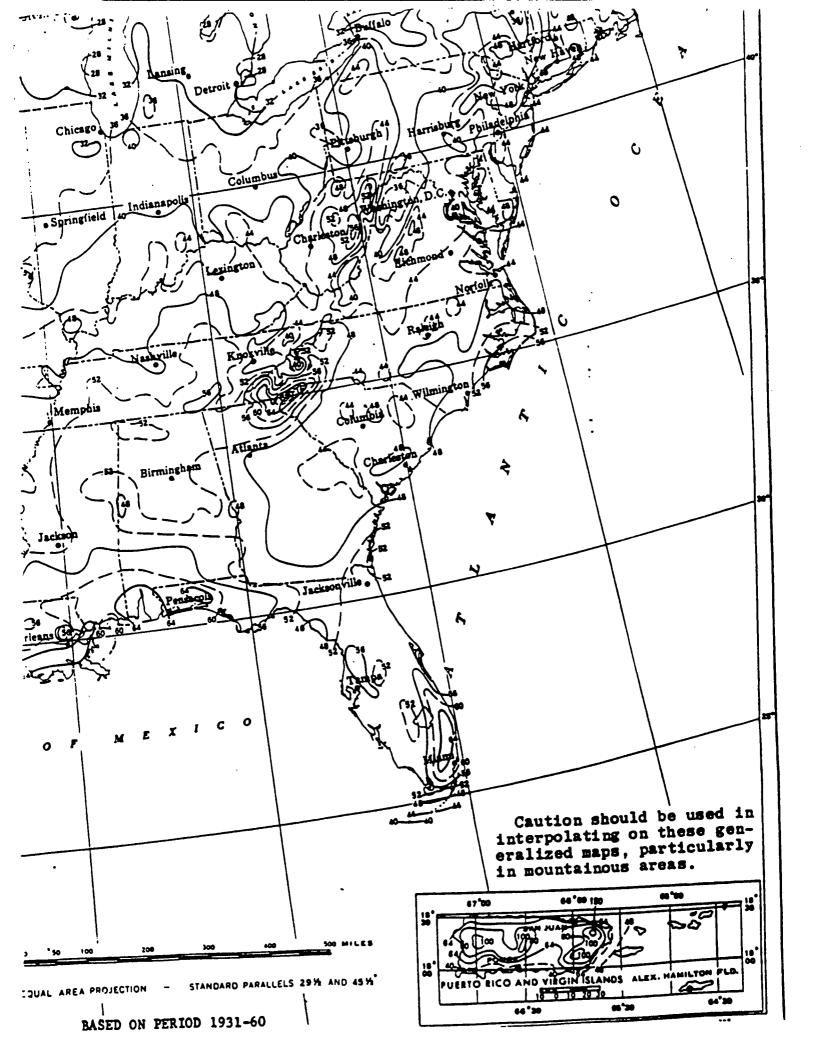
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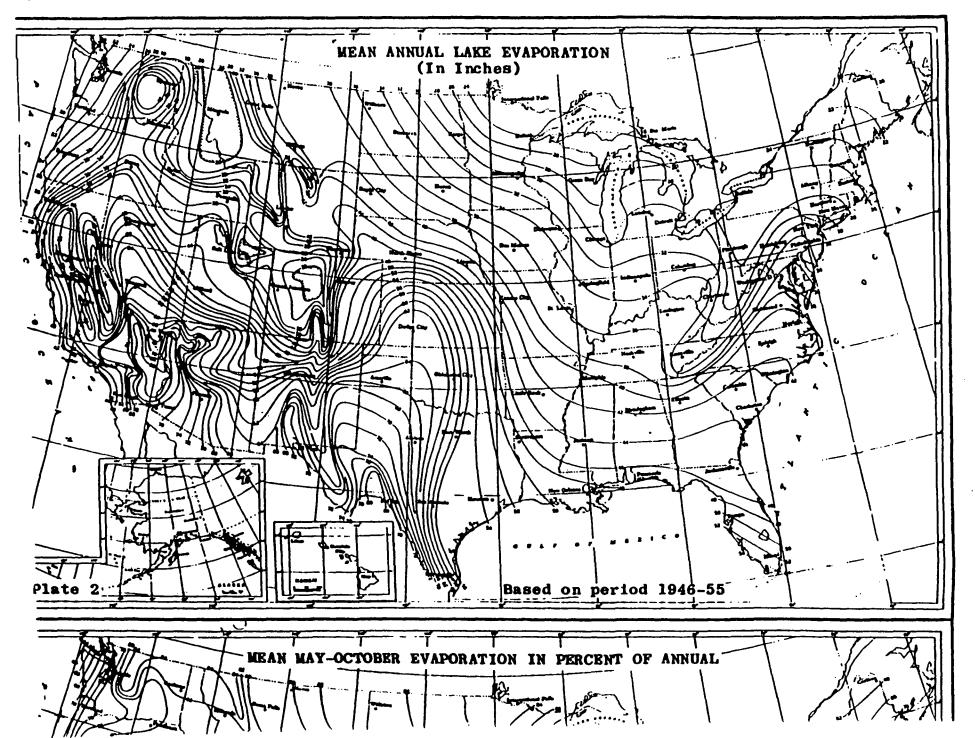
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TECHNICAL PAPER NO. 40

RAINFALL FREQUENCY ATLAS OF THE UNITED STATES

for Durations from 30 Minutes to 24 Hours and Return Periods from 1 to 100 Years

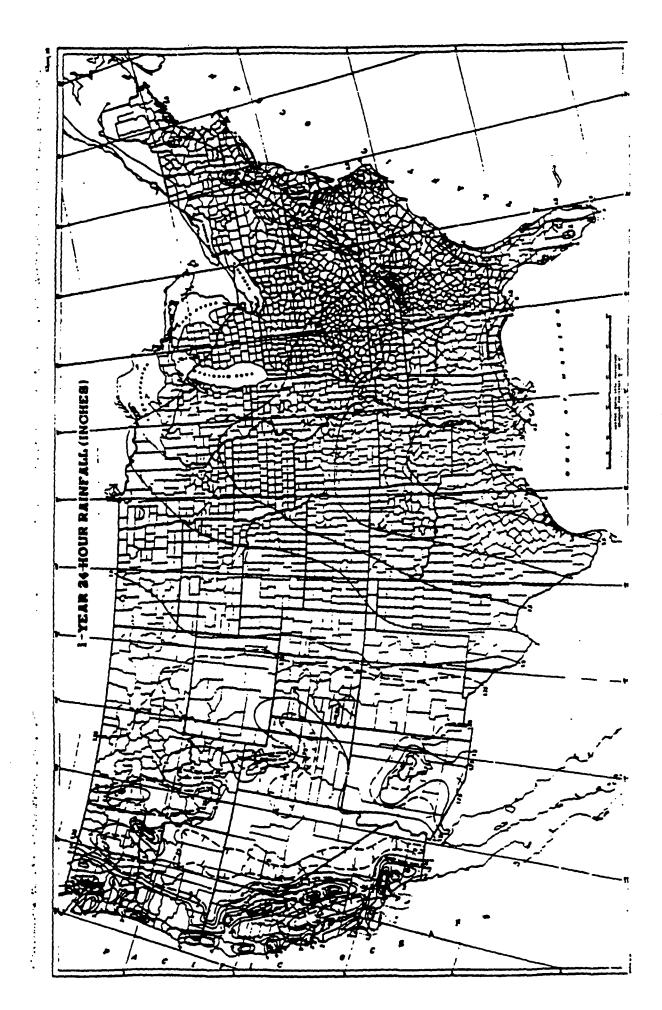
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PROPERTY OF EPA



GYPSUM STACK STATUS
SOUTHWEST DISTRICT
NOVEMBER 1988

DISCUSSION

As a result of the extraction of phosphate from ore, gypsum (hydrated calcium sulfate) is produced as a byproduct. The gypsum is pumped as a slurry with plant process water to the tops of gypsum stacks for disposal. The plant process water is typically characterized as having a very low pH and high concentrations of arsenic, cadmium, chromium, lead, sodium, fluoride, manganese, iron, sulfate and total dissolved solids (TDS). High levels of radioactive particle emissions are also typical for the plant process water.

Unless the gypsum stack and associated process water cooling pond are underlain by an impervious liner, contaminants are discharged to groundwater. Soils underlying the gypsum stack/cooling pond complexes will have a variable capacity to neutralize the low pH causing a number of the contaminants to precipitate from solution and attenuating the propogation of such contaminants in groundwater.

Of the 15 gypsum stack/cooling pond complexes in the Southwest District, ll continue phosphate fertilizer production and associated gypsum disposal activities. Four of the ll active facilities have recently submitted applications to expand their gypsum disposal operations.

With the exception of Gardinier, all gypsum stack facilities were issued permits for groundwater monitoring in September, 1985. The permittees collectively objected to language in their permits which restricted their zones of discharge to the surficial aquifer, and the permits were therefore withdrawn. All permits for groundwater monitoring were reissued in early 1986 except those for C.F. Industries, Central Phosphates, Conserv and Agrico Chemical Company. These facilities had groundwater contamination problems which they wished to resolve prior to applying for a second groundwater monitoring permit. Agrico Chemical Company was issued a permit for groundwater monitoring early in 1987 which provided for an extended zone of discharge. Twelve of the 15 facilities therefore have permits for groundwater monitoring.

All gypsum stack/cooling pond complexes routinely monitor proximal groundwater quality pursuant to approved groundwater monitoring plans. All 15 facilities are "Existing Installations" and are therefore not required to meet secondary drinking water standards at their property boundaries or within the Intermediate or Floridan aquifers unless surface waters or potable wells may be affected.

FACILITY OVERVIEW

C.F. Industries

The facility includes sulfuric acid plants, phosphoric acid plants, diammonium phosphate plants and a gypsum stack/cooling pond complex on approximately 1000 acres near Bartow in Polk County. Operations began at the facility in 1962 and gypsum disposal ceased for a time between 1986 and 1988. Gypsum disposal activities continue at about 25% of plant capacity.

A groundwater monitoring plan was submitted to the Department in September, 1983 and was approved in January, 1984. A permit for groundwater monitoring was issued to C.F. Industries on September 11, 1985 and was subsequently withdrawn on October 23, 1985. A groundwater monitoring permit has never been reissued for this facility. As a result of groundwater violations, C.F. Industries filed a petition for an extended zone of discharge on December 31, 1986.

Groundwater quality problems have been reported in the surficial aquifer at the site as follows:

Primary Drinking Water Standards

Contaminant	Concentration	Standard
arsenic	1.8 mg/L	.05 mg/L
cadmium	.51 mg/L	.01 mg/L
chromium	2.8 mg/L	.05 mg/L
sodium	2100 mg/L	160 mg/L
gross alpha	5480 pCi/L	l5 pCi/L
combined radium	8.9 pCi/L	5 pCi/L
fluoride	4690 mg/L	2 mg/L

Secondary Drinking Water Standards

<u>Contaminant</u>	<u>Concentration</u>	<u>Standard</u>
pH	1.5 SU	>6.5 SU
sulfate	4570 mg/L	250 mg/L

A Warning Notice was issued to C.F. Industries during July, 1985 for groundwater quality violations. The issues raised in the Warning Notice were to be resolved by an extended zone of discharge onto adjacent property, however a determination as to the extended zone of discharge is pending the collection of additional data.

Central Phosphates

The facility includes sulfuric acid plants, phosphoric acid plants, granulated triple superphosphate plants and a gypsum stack/cooling pond complex on approximately 1000 acres near Plant City in Hillsborough County. Operations began at the facility in 1965 and empanded in 1975.

A groundwater monitoring plan was submitted to the Department in September, 1983 and was approved in February, 1984. A permit for groundwater monitoring was issued to Central Phosphates on September 9, 1985 and was subsequently withdrawn on October 23, 1985. A groundwater monitoring permit has never been reissued for this facility. An application for an expanded gypsum stack/cooling pond complex was submitted by Central Phosphates on January 19, 1988 and withdrawn on November 4, 1988.

Groundwater quality problems have been reported in the surficial aquifer at the site as follows:

Primary Drinking Water Standards

Contaminant	<u>Concentration</u>	Standard
Cadmium	.022 mg/L	.01 mg/L
chromium	.052 mg/L	.05 mg/L
lead	.09 mg/L	.05 mg/L
sodium	1250 mg/L	160 mg/L
gross alpha	29 pČi/L	15 pCi/L

Secondary Drinking Water Standards

Contaminant	<u>Concentration</u>	<u>Standard</u>
manganese	12 mg/L	.05 mg/L
sulfate	5500 mg/L	250 mg/L
iron	260 mg/L	.3 mg/L
TDS	10,000 mg/L	500 mg/L

A Warning Notice was issued to Central Phosphates during July, 1985 for groundwater quality violations and a Consent Order was executed in September, 1987. Groundwater problems are now known to occur within the Floridan aquifer beyond the facility property boundary as follows:

Primary Drinking Water Standards

<u>Contaminant</u>	<u>Concentration</u>	<u>Standard</u>
sodium gross alpha	415 mg/L 29.4 pCi/L	160 mg/L 15 pCi/L

Secondary Drinking Water Standards

Contaminant	<u>Concentration</u>	<u>Standard</u>	
sulfate	2230 mg/L	250 mg/L	
iron	30 mg/L	.3 mg/L	
TDS	3700 mg/L	500 mg/L	
рH	6.37 SŬ	>6.5 SU	

Conserv

The facility includes a sulfuric acid plant, a phosphoric acid plant a diammonium phosphate plant and a gypsum stack/cooling pond complex on approximately 800 acres near Nichols in Polk County. Operations began at the facility in 1953 and expanded in 1962.

A groundwater monitoring plan was submitted to the Department in September, 1983 and was approved in February, 1984. A permit for groundwater monitoring was issued to Conserv on September 9, 1985 and was subsequently withdrawn on October 23, 1985. A groundwater monitoring permit has never been reissued for this facility. An application for an expanded gypsum stack/cooling pond complex was submitted by Conserv on February 16, 1988. It is anticipated that the application for an expansion permit will be withdrawn by Conserv.

Groundwater quality problems have been reported in the surficial aquifer at the site as follows:

Primary Drinking Water Standards

<u>Contaminant</u>	Concentration	Standard	
arsenic	.15 mg/L	.05 mg/L	
chromium	.22 mg/L	.05 mg/L	
sodium	630 mg/L	160 mg/L	
gross alpha	50 pCi/L	15 pCi/L	

Secondary Drinking Water Standards

Contaminant	<u>Concentration</u>	Standard	
sulfate	3620 mg/L	250 mg/L	
iron	llO mg/L	.3 mg/L	
manganese	3.4 mg/L	.05 mg/L	
pH ·	4.3 SU	>6.5 SŪ	
Tos	8760 mg/L	500 mg/L	

A Warning Notice was issued to Conserv in June, 1985 for groundwater quality violations. The issues raised in the Warning Notice are to be resolved by execution of an acceptable Consent Order.

Farmland Industries

The facility includes phosphoric acid plants and a gypsum stack/cooling pond complex on approximately 1000 acres near Bartow in Polk County. Operations began at the facility in 1965 and expanded in 1971.

A groundwater monitoring plan was submitted to the Department in September, 1983 and was approved in February, 1984. A permit for groundwater monitoring was issued to Farmland on September 11, 1985 and was subsequently withdrawn on October 23, 1985. A second permit for groundwater monitoring was issued on January 31, 1986.

Groundwater quality problems have been reported in the surficial aquifer at the site as follows:

Primary Drinking Water Standards

Contaminant	<u>Concentration</u>	Standard	
chromium	.066 mg/L	.05 mg/L	
sodium gross alpha	1064 mg/L 111.9 pCi/L	160 mg/L 15 pCi/L	

Secondary Drinking Water Standards

Contaminant	Conce	ntration	Stan	dard
iron	30	mg/L	.3	mg/L
manganese	.38	mg/L	.05	mg/L
TDS	11,000	mg/L	500	mg/L
sulfate.	3500	mg/L	250	mg/L

A Warning Notice was issued to Farmland during October, 1987 for groundwater quality violations. A proposed Consent Order is to be issued to Farmland by December, 1988.

Gardinier

The facility includes sulfuric acid plants, phosphoric acid plants, triple superphosphate plants, ammonium phosphate plants and a gypsum stack/cooling pond complex on approximately 2600 acres near Gibsonton in Hillsborough county. Operations began at the facility in 1924 and closure of the existing facility is anticipated by 1990 as construction of a new facility on separate property has recently been permitted.

A groundwater monitoring plan was submitted to the Department in September, 1983 and was approved in January, 1984. A permit for groundwater monitoring was issued to Gardinier on May 19, 1986.

The Department filed a complaint against Gardinier in June, 1988 to address environmental impacts associated with an acid spill which occurred in May, 1988.

Agrico Chemical Company

The facility includes sulfuric acid plants, phosphoric acid plants, a granulated triple superphosphate plant and a gypsum stack/cooling pond complex on approximately 2200 acres near Fort Meade in Polk County. Operations began at the facility in 1955.

A groundwater monitoring plan was submitted to the Department in September, 1983 and was approved in January, 1984. A permit for groundwater monitoring was issued to Agrico on September 10, 1985 and was subsequently withdrawn on October 23, 1985. A second permit for groundwater monitoring was issued on January 30, 1987 which provided for an extended zone of discharge onto adjacent property.

Groundwater quality problems have been reported in the surficial aquifer at the site as follows:

Primary Drinking Water Standards

Contaminant	Concentrat	<u>ion</u>	Stand	<u> </u>
arsenic	.26 mg/	L	.05	mg/L
sodium	1146 mg/:	L	160	mg/L
gross alpha	152.4 pCi.	/L	15	pCi/L
combined radium	34.2 pCi.	/L	5	pCi/L

Secondary Drinking Water Standards

Contaminant	Concentration	Standard	
sulfate	2900 mg/L	250 mg/L	
TDS	7046 mg/L	500 mg/L	

A Warning Notice was issued to Agrico during July, 1985 for groundwater quality violations. The issues raised in the Warning Notice were resolved by extending the facility zone of discharge onto adjacent property.

American Cyanamid

The facility included a sulfuric acid plant, a phosphoric acid plant, a triple superphosphate plant and a gypsum stack/cooling pond complex on approximately 300 acres near Fort Meade in Polk County. Operations began at the facility in 1957 and ceased in 1971.

A groundwater monitoring plan was submitted to the Department in September, 1983 and approved in March, 1984. A permit for groundwater monitoring was issued to American Cyanamid on June 5, 1984 and subsequently withdrawn on October 23, 1985. A second permit for groundwater monitoring was issued on April 30, 1986.

Eleven of the 15 gypsum stack/cooling pond complexes are reportedly violating primary drinking water standards within the surficial aquifer at their property boundaries, and/or within the Intermediate or Florida aquifers. Groundwater quality investigations at 6 of these 11 facilities are currently being conducted through various enforcement mechanisms. As mentioned previously, groundwater quality violations at the Agrico Chemical facility have been addressed by modifying their groundwater monitoring permit to provide for an extended zone of discharge onto adjacent property.

All 15 gypsum stack/cooling pond complexes may be expected to leach contaminants to groundwater for a period of 50 years or more following the cessation of gypsum disposal activities. Appropriate site closure may help to minimize the spread of contaminants to proximal groundwater or surface water. Innovative uses of the remaining gypsum such as incorporation into building materials or road bed materials may also be encouraged during site closure.

Solid waste statutes which became effective October 1, 1988 require that all facilities disposing of their own solid waste on their own property after that date address groundwater discharges through an appropriate permit. The extent to which other solid waste rules, such as those requiring impervious liners, site closure and financial assurance, may apply to gypsum stacks is unclear.

Secondary Drinking Water Standards

Contaminant	<u>Concentration</u>	Standard
sulfate	2615 mg/L	250 mg/L
TDS	8144 mg/L	500 mg/L
iron	21.8 mg/L	.3 mg/L
manganese	.46 mg/L	.05 mg/L
pH	6.1 SŬ	>6.5 SŪ

Royster, Piney Point former beaMAXI

The facility includes sulfuric acid plants, phosphoric acid plants, ammoniated fertilizer plants and a gypsum stack/cooling pond complex on approximately 300 acres in Manatee County. Operations began at the facility in 1966 and expanded in 1978.

A groundwater monitoring plan was submitted to the Department in September, 1983 and was approved sometime thereafter. A permit for groundwater monitoring was issued to AMAX on September 9, 1985 and was subsequently withdrawn on October 23, 1985. A second permit for groundwater monitoring was issued on March 14, 1987, following the collection of additional information.

Groundwater quality problems have been reported in the surficial aquifer at the site as follows:

Primary Drinking Water Standards

Contaminant	<u>Concentration</u>	<u>Standard</u>
sodium	180 mg/L	160 mg/L

Secondary Drinking Water Standards

Contaminant	<u>Concentration</u>	Standard
sulfate	745 mg/L	250 mg/L
TDS	1586 mg/L	500 mg/L
manganese	.31 mg/L	.05 mg/L
iron	2.9 mg/L	.3 mg/L

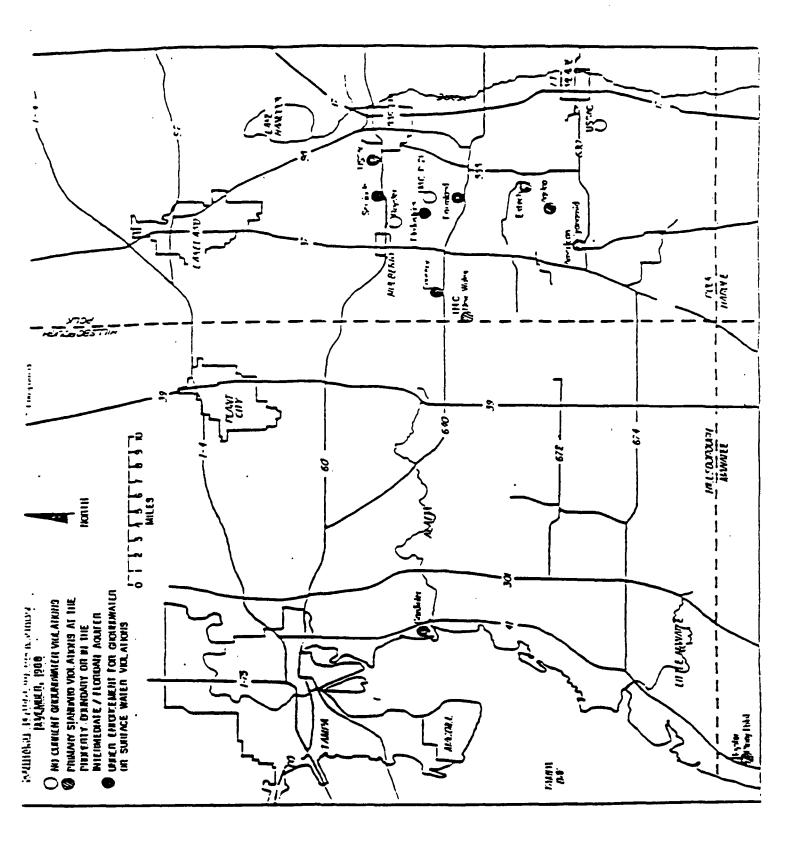
Whether contaminants reported at Royster, Piney Point may be attributed to proximity to Tampa Bay is unclear.

Seminole Fertilizer (formerly W.R. Grace)

The facility includes sulfuric acid plants, granulated triple superphosphate plants, phosphoric acid plants, diammonium phosphate plants and two gypsum stack/cooling pond complexes on approximately 2000 acres near Bartow in Polk County. One gypsum stack/cooling pond complex is located north of SR 60 adjacent to the fertilizer plant, and the other gypsum stack/cooling pond complex is located south of SR 60. Operations at the north gypsum stack began in 1954 and operations at the south gypsum stack began in 1965.

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A groundwater monitoring plan was submitted to the Department in September, 1983 and was approved sometime thereafter. A permit for groundwater monitoring was issued to W.R. Grace on September 10, 1985 and was subsequently withdrawn on October 23, 1985. A second permit for groundwater monitoring was issued to W.R. Grace on April 15, 1986.

Groundwater quality problems have been reported in the surficial aguifer at the site as follows:

Primary Drinking Water Standards

Contaminant	Concentration	Standard
sodium	759 mg/L	160 mg/L
gross alpha	80 pCi/L	15 pCi/L
combined radium	l4.4 pCi/L	5 pCi/L

Secondary Drinking Water Standards

Contaminant	<u>Concentration</u>	<u>Standard</u>
sulfate TDS	2012 mg/L 4284 mg/L	250 mg/L 500 mg/L
iron	245 mg/L	.3 mg/L
manganese	.25 mg/L	.05 mg/L

A Warning Notice was issued to W.R. Grace on March 3, 1988 for violations of groundwater quality standards. Subsequently, contaminants were discovered in nearby potable wells as follows:

Primary Drinking Water Standards

Contaminant	Concen	<u>tration</u>	Sta	ndard
arsenic	.075	mg/L	.05	mg/L
lead	.181	mg/L	.05	mg/L
sodium	176.7	mg/L	160	mg/L
gross alpha	59	pČi/L	15	pCi/L
combined radium	18.8	pCi/L	5	pCi/L

Secondary Drinking Water Standards

<u>Contaminant</u>	Concentration	Standard
sulfate	606 mg/L	250 mg/L
TDS iron	831 mg/L 29.6 mg/L	500 mg/L .3 mg/L

The potable wells have recently been replaced with city water, and a proposed Consent Order is to be issued to W.R. Grace by December, 1988.

USSAC, Bartow

The facility includes a sulfuric acid plant, a phosphoric acid plant, a diammonium phosphate plant and a gypsum stack/cooling pond complex on approximately 1000 acres near Bartow in Polk county. Operations began at the facility in 1946 and ceased in 1981.

A groundwater monitoring plan was submitted to the Department in September, 1983 and was approved sometime thereafter. A permit for groundwater monitoring was issued to USS Agrichemical on September 11, 1985 and was subsequently withdrawn on October 23, 1985. A second permit for groundwater monitoring was issued on June 19, 1986.

Groundwater quality problems have been reported in the surficial aquifer as follows:

Primary Drinking Water Standards

Contaminant	Concentration	Standard
sodium	245 mg/L	160 mg/L

Secondary Drinking Water Standards

Contaminant	<u>Concentration</u>	Standard
sulfate TDS	1332 mg/L 3131 mg/L	250 mg/L 500 mg/L
manganese	.59 mg/L	.05 mg/L

USSAC Fort Meade

The facility includes sulfuric acid plants, phosphoric acid plants, triple superphosphate plants and a gypsum stack/cooling pond complex on approximately 1000 acres near Fort Meade in Polk County. Operations at the facility began in 1961.

A groundwater monitoring plan was submitted to the Department in September, 1963 and was approved sometime thereafter. A permit for groundwater monitoring was issued to USS Agrichemical on September 9, 1985 and was subsequently withdrawn on October 23, 1985. A second permit for groundwater monitoring was issued on July 14, 1986.

Groundwater quality problems have been reported in the surficial aguifer at the site as follows:

Secondary Drinking Water Standards

Continue	Concentration	Standard
iron	11.4 mg/L	.3 mg/l
mançanese	.12 mg/1	.CE
	-	

Estech

The facility began operation in 1948 and ceased operation in 1968. Little information is available in Department files as to the nature of the facility operation.

A groundwater monitoring plan was submitted to the Department in September, 1983 and was approved in August, 1984. A permit for groundwater monitoring was issued to Estech on September 11, 1985 and was subsequently withdrawn on October 23, 1985. A second permit for groundwater monitoring was issued on May 19, 1986.

Groundwater quality problems have been reported in the Intermediate aquifer at the site as follows:

Primary Drinking Water Standards

<u>Contaminant</u>	Concentration	Standard
gross alpha combined radium	26.2 pCi/L 13.6 pCi/L	15 pCi/L 5 pCi/L

Groundwater quality problems have been reported in the surficial aquifer at the site as follows:

Primary Drinking Water Standards

Contaminant	<u>Concentration</u>	Standard	
sodium gross alpha combined radium	441 mg/L 54.1 pCi/L 14.3 pCi/L	160 mg/L 15 pCi/L 5 pCi/L	
COMPTHER LEGITAM	TA'S BCT\P	3 bc1/1	

Secondary Drinking Water Standards

<u>Contaminant</u>	<u>Concentration</u>	Standard	
sulfate	1860 mg/L	250 mg/L	
TDS	3300 mg/L	500 mg/L	
iron	18 mg/L	.3 mg/L	
manganese	1.1 mg/L	.05 mg/L	

TMC 0-21

The facility was in operation during the late 1950s and early 1960s, and little information is available as to the nature of past operations.

A groundwater monitoring plan was submitted to the Department in March, 1985 and was approved in May, 1985. A permit for groundwater monitoring was issued to IMC on September 11, 1985, and was subsequently withdrawn on October 23, 1985. A second permit for groundwater monitoring was issued on March 11, 1986.

Groundwater quality problems have been reported in the surficial aquifer at the site as follows:

Secondary Drinking Water Standards

Contaminant	Concentration	Standard	
sulfate	1431 mg/L	250 mg/L	
TDS	2175 mg/L	500 mg/L	
iron	125.4 mg/L	.3 mg/L	
manganese	.78 mg/L	.05 mg/L	

Royster, Mulberry

The facility includes sulfuric acid plants, phosphoric acid plants and a gypsum stack/cooling pond complex on approximately 1000 acres near Mulberry in Polk County. No records are available as to when operations began at the facility.

A groundwater monitoring plan was submitted to the Department in December, 1983 and was approved in January, 1984. A permit for groundwater monitoring was issued to Royster on September 11, 1985 and was subsequently withdrawn on October 23, 1985. A second permit for groundwater monitoring was issued on July 9, 1986. An application for a construction permit to expand the gypsum stack/cooling pond complex was submitted to the Department in April, 1987, and a construction permit for the expansion was issued to Royster in March, 1988.

Groundwater quality problems have been reported in the surficial aguifer at the site as follows:

Secondary Drinking Water Standards

<u>Contaminant</u>	<u>Concentration</u>	Standard	
iron	5.9 mg/L	.3 mg/L	
pH	5.8 SU	>6.5 SU	

No problems have been reported for the Intermediate aquifer monitor wells, however the well completion reports indicate that the Intermediate aquifer monitor wells are in fact completed in the Florida aquifer. Thus no monitor wells have been installed so as to monitor groundwater quality in the Intermediate aquifer.

Groundwater quality problems have been reported in the surficial aquifer at the site as follows:

Primary Drinking Water Standards

Contaminant	Concentration	Standard	
sodium	258.9 mg/L	160 mg/L	
gross alpha	30.3 pCi/L	15 pCi/L	

Secondary Drinking Water Standards

Contaminant	<u>Concentration</u>	Standard	
sulfate	1424 mg/L	250 mg/L	
TDS	4292 mg/L	500 mg/L	
iron	45.6 mg/L	.3 mg/L	
manganese	1.36 mg/L	.05 mg/L	

Enforcement action has not been initiated against American Cyanamid.

IMC New Wales

The facility includes sulfuric acid plants, phosphoric acid plants granulated triple superphosphate plants and a gypsum stack/cooling pond complex on approximately 1600 acres near Nichols in Polk County. Operations began at the facility in 1975.

A groundwater monitoring plan was submitted to the Department in September, 1983 and was approved in February, 1984. A permit for groundwater monitoring was issued to IMC on September 9, 1985 and was subsequently withdrawn on October 23, 1985. A second permit for groundwater monitoring was issued on March 19, 1986. An application for an expanded gypsum stack/cooling pond complex was submitted by IMC on August 31, 1988.

No groundwater problems have been reported in the surficial aquifer at the facility property boundary. The following groundwater problems have been reported for the Intermediate aquifer, however the appropriateness of the monitor well construction is in question:

Primary Drinking Water Standards

<u>Contaminant</u>	<u>Concentration</u>	<u>Standard</u>
sodium	1030 mg/L	160 mg/L
cross alpha	20 pCi/L	15 pCi/L
combined radium	15.2 pCi/L	5 pCi/L

CONSOLIDA

FEED SUPPLEMENT DIVISION

September 16, 1987

Mr. Sam Sahebramamni, P.E.
Industrial Waste Programs
Department of Environmental Regulations
4520 Oak Pair Boulevard
Tampa, Plorida 33610-7347

Dear Mr. Sahebsamani:

In accordance with the terms of Permit IO41-129068A, we are transported that the third quarterly report for 1987 of the groundwater wells at Piney Point. All the wells exceed the MCL for severa secondary parameters. With exception of well no. 6, the MC: primary parameters were generally not exceeded.

As pointed out in the letter transmitting the report in Juris an apparent contamination problem with well MW-6, several phave high values. To repeat - this well is 65 feet deep, cafeet. The casing—may have a break causing contamination. is located very close to a deep seepage ditch which could have on the results experienced. We again propose that MW-6 be plugged and that another location be selected to monitor the inaquifer.

As mentioned previously, we are anxious to pursue a solution your concurrence to select a different site for a new MW-6 look sorward to your reply.

Yours very truly,

John G. Cladakis Senior Vice President a Operations Manager Piney Point Complex

MD

Mr. W. L. Priesmeyer Mr. B. V. Galloway Mr. B. Barrison

PARAMETER MONITORING REPORT (Rule 17-3.402, 17-3.404 - 17-3.406)

HS /	4041 A 13768	Saa	ple Dete	7/29/8
denitering	Well #	Well	l Types	[] Backs
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lassifies	tion of Groundwater	G-II		(x) Sur:
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PRIMARY STANDARDS

PRIMARY STANDARDS						
TORET	Parametet Monitored	Sempling Method	Analysis Method	Analysis Result	Units	Sample filtered/Unfiltered
	Arsenic	(1)	(2)	< .01	mg/1	unfiltered
	Cadmium	(1)	(2)	.00	ma/1	unfiltered
	Chromium	(1)	(2)	.02	mq/1	unfiltered
	Lead	(1)	(2)	.02	mg/l	unfiltered
	Nitrate (ASN	(1)	(2)		mg/1	unfiltered
}	Sodium	(1)	(2)	35.0	mg/1	unfiltered
}	Fluoride	(1)	(2)	1.3	mq/1	unfiltered
	Gross Alpha	(1)	(2)	< 2.0 €	pCi/l	unfiltered
1	R 226	(1)	(2)	N.R.	pCi/l	unfiltered
İ	1228	(1)	(2)	N.R.	pCi/l	unfiltered
1	Secondary St.	andards				
	Chloride	(1)	(2)	57.0	mq/1	unfiltered
	Color	(1)	(2.)	.105.0	cl-pt	unfiltered
İ	Copper	(1)	(2)	.01	mq/1	unfiltered
.	Iron	(1)	(2)	.60	mg/l	unfiltered
· }	Manganese	(1)	(2)	.06	mg/1	unfiltered
].	Rq	(1)	(2)	6.1		unfiltered
1	Sulfate	(1)	(2)	162.0	mq/1	unfiltered
	.TDS	(1)	(2)	726.0	mg/1	unfiltered
	7ine	(1)	(2)	.01	mq/1	unfiltered
.	Corrosivity	(1)	(2)	+1.3	Langelier	unfiltered
!	Poaming agent	* (1)	(2)	-	HRAS	unfiltered
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Odor (1) (2) N.O. unfiltered li development is the process of pumping the well prior to empling in order to resentative ground water sample.

orm 17-1.216(2) ective January 1, 1983

Page 2 of 3

N.R. - Not Required

State of Florida DEPARTMENT OF ENVIRONMENTAL

REFERENCE 8

Interoffice Memo

TO: .

Sam Sahebzamani

Southwest District

THROUGH:

Richard Garrity

Southwest District

Richard Harvey < 🗶 Division of Water Yat

FROM:

Al Bishop()

Point Source Evaluation Section

OCT 0 5 1988

(0)11

DATE:

September 28, 1988

BOUTH WEST DISTRICT SUBJECT: WQBEL for Royster Phosphate Piney Point Facility (formerly CM

(Manatee County)

We were recently contacted by Mr. Ivan Nance of Royster Phosphates, Inc. informed us that Royster had purchased the Consolidated Minerals, Inc. Piney Point facility. He said that he wanted to reinitiate the WQBEL L analysis for the Piney Point discharge because Royster would like to be permitted to discharge from outfall 003 at "normal" high flow condition had earlier terminated WQBEL development for the Piney Point discharge request of CMI who had agreed to a modification of their permit (IO41-1 to only allow discharge following back to back 25 year storm events. I of the Level II analysis, we had recommended that the operating permit amended to require CMI to provide rainfall data from the Ruskin weather each time they reported a discharge from 003.

In light of Mr. Nance's request to reinitiate WQBEL development, we now recommend that the permit remain in effect without modification. As st in the permit, Royster is now proceeding with the WQBEL development pro should be allowed to discharge at the limits specified in the permit.

We have already been in contact with Royster's consultant, Conservation Consultants, Inc. (CCI), and have discussed at length both the data and modeling requirements for the WQBEL study. Daryll Joyner of my staff m site visit on September 7, 1988 to survey the receiving waters and to h with plan of study development. CCI is currently writing a draft plan for our review. We will provide you with a copy of the draft plan when available and will keep you apprised of all progress on the project.

If you have any questions or comments regarding the Level II analysis, call me or Daryll Joyner at Suncom 278-0780.

AB/DJ/cc



LEVEL

NOTEBOOK NO. 311

Am Ax Phosphate

Ton: F4-9009 - 01

Palmetta, Manate County,
Florida

P.M.: Maureen Gosdon

LOGBOOK REQUIREMENTS REVISED - NOVEMBER 25, 190

NOTE: ALL LANGUAGE SHOULD BE FACTUAL AND OBJECTIVE

- Record on front cover of the Lagbook: TDD Na., Site Name, Site Lacation, Project Manager.
- Alf entries are made using ink. Draw a ungle line through errors. Initial and date corrections.
- Statement of Work Plan, Study Plan, and Safety Plan discussion and distribution to field team with team members' ugnatures.
- Record weather conditions and general site information.
- Sign and date each page. Project Manager is to review and sign off on each logbook daily.
- Document all calibration and pre-operational checks of equipment. Provide serial numbers of equipment used onsite.
- Provide reference to Sampling Field Sheets for detailed sempting information.
- Describe sampling locations in <u>detail</u> and document all changes from project planning documents.
 - Provide a site sketch with sample locations and photo locations
- Maintain photo log by completing the stamped information at the end of the logbook. ë
- If no site representative is on hand to accept the receipt for samples, an entry to that effect must be placed in the logbook.
- Record I.D. numbers of COC and receipt for sample forms used. Also record numbers of destroyed documents.

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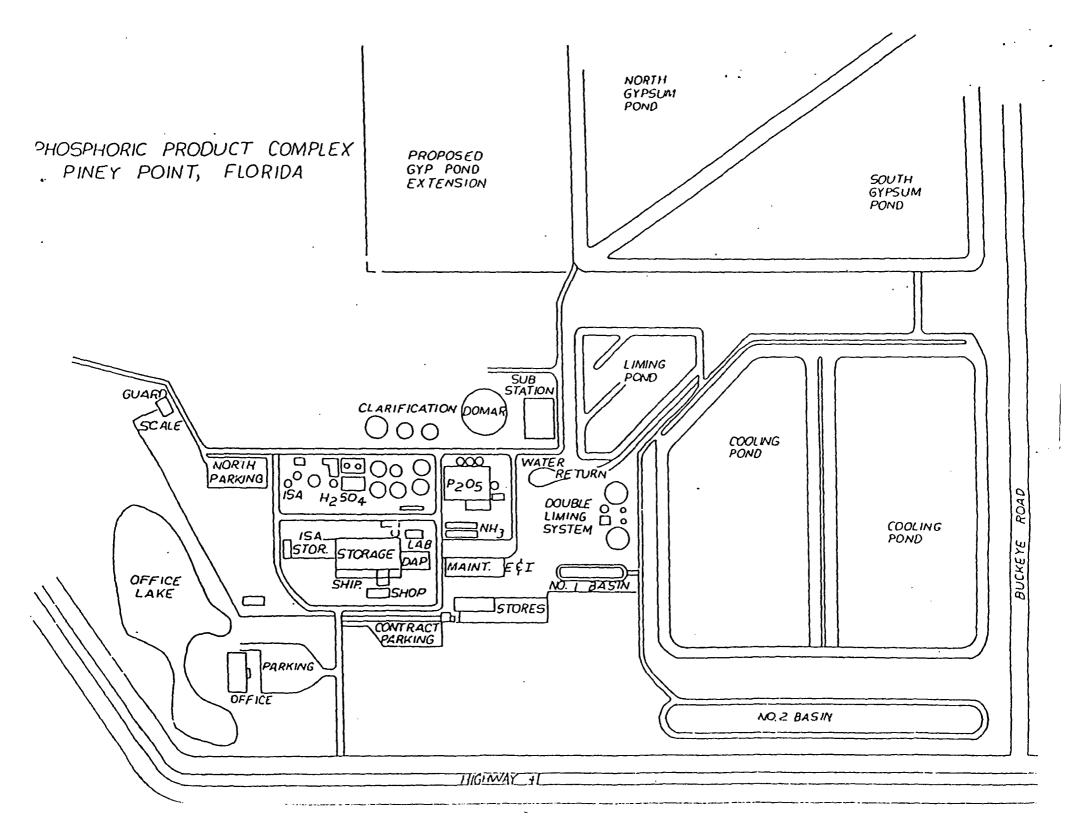
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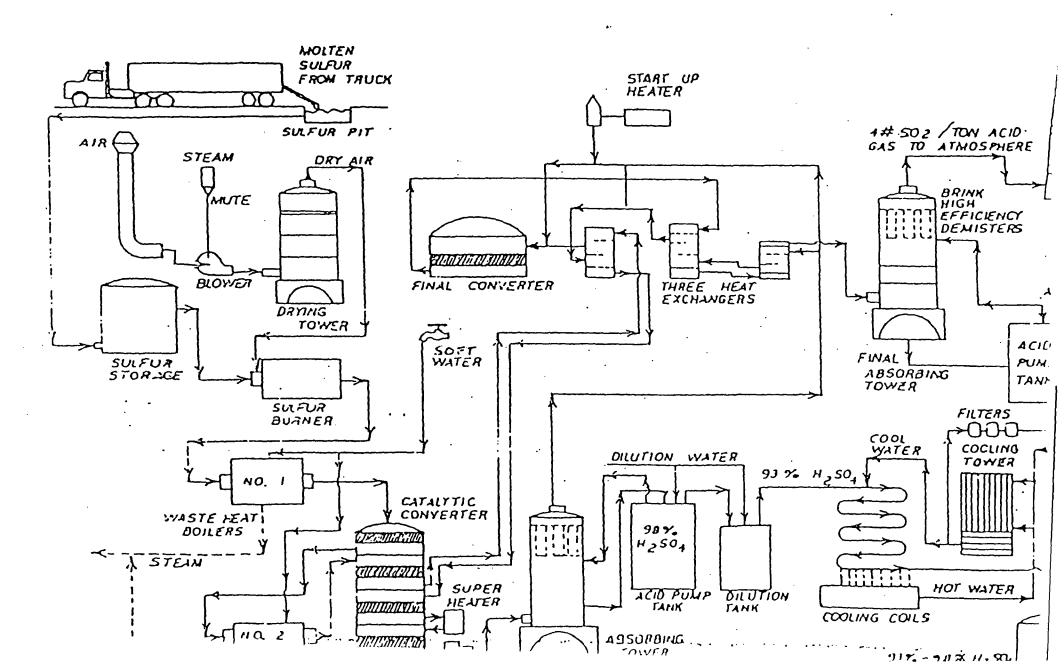
Royster Phosphates, Inc.

P. O. Box 1329 Palmetto, Florida 34220

PINEY POINT PHOSPHORIC COMPLEX MANATEE COUNTY, FLORIDA



Royster Phosphates, Inc. SULFURIC ACID PLANT (H2504) CONTACT PROCESS



Royster Phosphates, Inc.

P. O. Box 1329 Palmetto, Florida 34220

PHOSPHORIC PRODUCTS COMPLEX PINEY POINT, FLORIDA

SULFURIC ACID

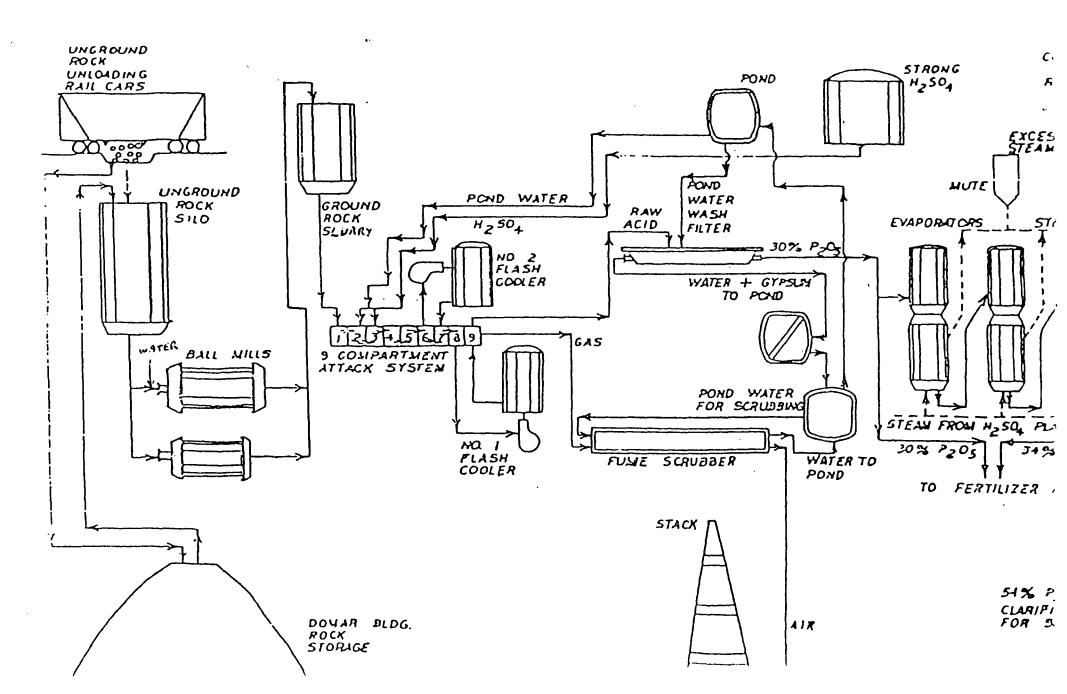
THE BASIC RAW MATERIALS FOR THE MANUFACTURE OF SULFURIC ACID ARE SULFUR, AIR AND WATER. AT THIS PLANT WE BRING IN MOLTEN SULFUR BY TRUCK WHICH HAS BEEN SHIPPED BY TANKER TO TAMPA FROM LOUISIANA OR TEXAS. THE SULFUR IS BURNED IN A CONTROLLED AMOUNT OF AIR, THEN IT IS CAUSED TO REACT AD-DITIONALLY WITH OXYGEN IN THE AIR BY THE USE OF A CATALYST. THE PRODUCT FROM THIS LATTER REACTION IS ABSORBED IN SULFURIC ACID AND WATER TO PROVIDE THE CORRECT STRENGTH OF SULFURIC ACID, ALTHOUGH THE PROCESS IS CHEMICALLY SIMPLE, STRICT CONTROLS ARE NECESSARY IN ORDER TO HAVE AN ECONOMICALLY SOUND PROCESS THAT PREVENTS THE LOSS OF SULFUR COMPOUNDS TO THE ATMOSPHERE. BASICALLY, THE CONTROLS ARE ACID TEMPERATURE AND STRENGTH, TEMPERATURE IS CONTROLLED PRIMARILY BY THE OPERATION OF BOILERS AND COOLING COILS. THE ACID STRENGTH IS CONTROLLED BY ANALYSIS AND VARIOUS CONTROL INSTRUMENTS IN THE PLANT, THAT INDICATE WHEN WATER ADDITION IS NECESSARY.

PAGE TWO

THIS SULFURIC ACID PLANT WAS, AT ONE TIME, THE LARGEST SINGLE UNIT PLANT IN THE WORLD AND IS STILL ONE OF THE LARGEST. THE SIZE IS ILLUSTRATED BY THE LARGE SIZES OF PARTICULAR PIECES OF EQUIPMENT IN THE PLANT. THE STEAM TURBINE DRIVEN AIR BLOWER OF 3560 HORSEPOWER AND THE MASSIVE 4-PASS CONVERTER ARE PRIME EXAMPLES.

THE THREE CYLINDRICAL TOWERS OVER THE CONTROL ROOMS ARE, THE DRYING TOWER AND NO. 1 AND 2 ABSORBING TOWERS. THE AIR ENTERING THE PLANT IS CLEANED AND DRIED IN THE DRYING TOWER. THE TWO TALLER TOWERS ARE THE ABSORBING TOWERS, MECHANICALLY IDENTICAL TO THE DRYING TOWER. THEIR GREATER HEIGHT IS USED TO ACCOMMODATE HIGH EFFICIENCY BRINK MIST ELIMINATORS WHICH SAFEGUARD THE ENVIRONMENT BY EFFECTIVELY ELIMINATING THE POSSIBILITY OF ESCAPING ACID MIST OR OXIDES OF SULFUR.

Royster PHOSPHORIC ACID PLANT (P205) WET PROCESS



PHOSPHORIC ACID

THE BASIC RAW MATERIALS FOR THE PRODUCTION OF PHOSPHORIC ACID ARE PHOSPHATE ROCK, SULFURIC ACID AND WATER. WE OBTAIN PHOSPHATE ROCK FROM FLORIDA MINES AND THE SULFURIC ACID FROM OUR OWN PLANT.

THE WET PHOSPHATE ROCK IS FED WITH ADDITIONAL WATER
TO ONE OF TWO BALL MILLS AND GROUND INTO A SLURRY RESEMBLING SOFT ICE CREAM. THE ROCK SLURRY IS THEN PUMPED
FROM THE MILL DISCHARGE TANK TO THE COMPARTMENTED PHOSPHORIC ACID REACTION TANK.

THE LIQUID SLURRY RESULTING FROM THE REACTION OF PHOSPHATE ROCK AND SULFURIC ACID IS FILTERED ON AN ELABORATE, CONTINUOUS FILTER AND PHOSPHORIC ACID IS REMOVED FROM THE FILTER AS PRODUCT. THE SOLIDS REMOVED BY THE FILTER ARE ESSENTIALLY GYPSUM (CALCIUM SULFATE DIHYDRATE) AND THIS MATERIAL IS TRANSPORTED AS A WATER SLURRY FROM THE FILTER TO A GYPSUM SETTLING POND. THE ACID PRODUCT FROM THE FILTER CONTAINS APPROXIMATELY 30% P205. (PHOSPHORIC ACID STRENGTH IN THE FERTILIZER INDUSTRY IS UNIVERSALLY ANALYZED AND REPORTED AS PERCENT P205. FROM A STRICT CHEMICAL POINT OF VIEW, THE 30% P205 PRODUCT IS ACTUALLY ABOUT 41% STRENGTH AS ORTHO PHOSPHORIC ACID, H3P04.)

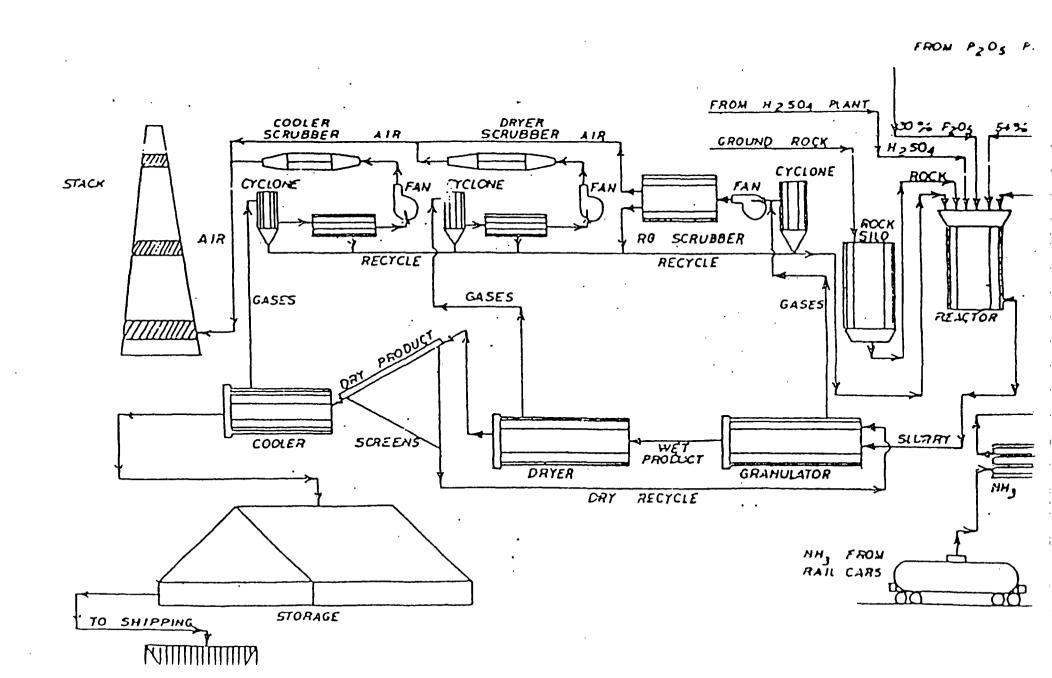
PHOSPHORIC ACID

PAGE TWO

THE 30% ACID IS CONCENTRATED TO ABOUT 54% P205 IN THREE (3) VACUUM EVAPORATORS TO MAKE A PRODUCT MORE SUITABLE FOR SHIPMENT. THE 54% ACID IS ALLOWED TO AGE AND SETTLE BEFORE SHIPMENT. THE AGING AND SETTLING WHICH REDUCE IMPURITIES IN THE ACID, IS CARRIED OUT IN THE LARGE TANKS JUST NORTH OF THE PHOSPHORIC ACID PLANT.

EXHAUST AIR FROM THE PHOSPHORIC ACID PROCESS IS WASHED WITH RECYCLED WATER TO SCRUB OUT HARMFUL GASES BEFORE DISCHARGE FROM THE STACK.

Royster DRY PRODUCTS - DIAMMONIUM PHOSPHATE OR TRIPLE SUPER PHOSPHATE



FERTILIZER PLANT

WE MANUFACTURE DIAMMONIUM PHOSPHATE (DAP 18-46-0) IN OUR FERTILIZER PLANT. WE ALSO HAVE THE ABILITY TO PRODUCE GRANULAR TRIPLE SUPER PHOSPHATE (GTSP 0-46-0). BASICALLY THE SAME EQUIPMENT IS USED IN PRODUCING EITHER PRODUCT. ONLY THE RAW MATERIALS USED, OR THEIR PROPORTIONS, ARE CHANGED.

TO PRODUCE 18-46-0, PHOSPHORIC ACID, FROM OUR PLANT,

AND ANHYDROUS AMMONIA, WHICH IS BROUGHT IN BY RAILROAD, ARE

THE BASIC INGREDIENTS. IF WE WERE PRODUCING 0-46-0 WE USE

PHOSPHORIC ACID FROM OUR PLANT AND BRING IN GROUND 75 BPL

(75% BONE PHOSPHATE OF LIME) PHOSPHATE ROCK FROM FLORIDA

MINES.

IN BOTH PROCESSES THE RAW MATERIALS ARE ADDED TOGETHER
IN A TANK WHERE THE CHEMICAL REACTIONS ARE COMPLETED AND THE
RESULTING LIQUID SLURRY IS PUMPED TO THE SOLIDS MATERIALS
HANDLING SYSTEM. IN THE SOLIDS SYSTEM THE REACTION PRODUCTS
ARE DISTRIBUTED UPON A BED OF RETURNING SOLID MATERIAL. BY
CONTROLLING THE PROPORTIONS OF REACTION PRODUCTS AND SOLID
MATERIALS WE OBTAIN CONTROL OVER THE SIZE AND APPEARANCE OF
THE FINISHED PRODUCT. AFTER THE PRODUCT HAS BEEN FORMED INTO
THE DESIRED SIZE OF GRANULES IT IS DRIED, SCREENED AND CONVEYED
TO THE PRODUCT STORAGE.

THIS PARTICULAR PLANT IS RATHER ADVANCED IN THAT THE MATERIALS HANDLING EQUIPMENT IS OF SUCH SIZE AND DESIGN THAT CONTROL OF THE PROCESSES IS CONVENIENTLY ACCOMPLISHED. IN PARTICULAR, THE DRYER IS 11' IN DIAMETER AND 90' LONG, WHICH

FERTILIZER PLANT

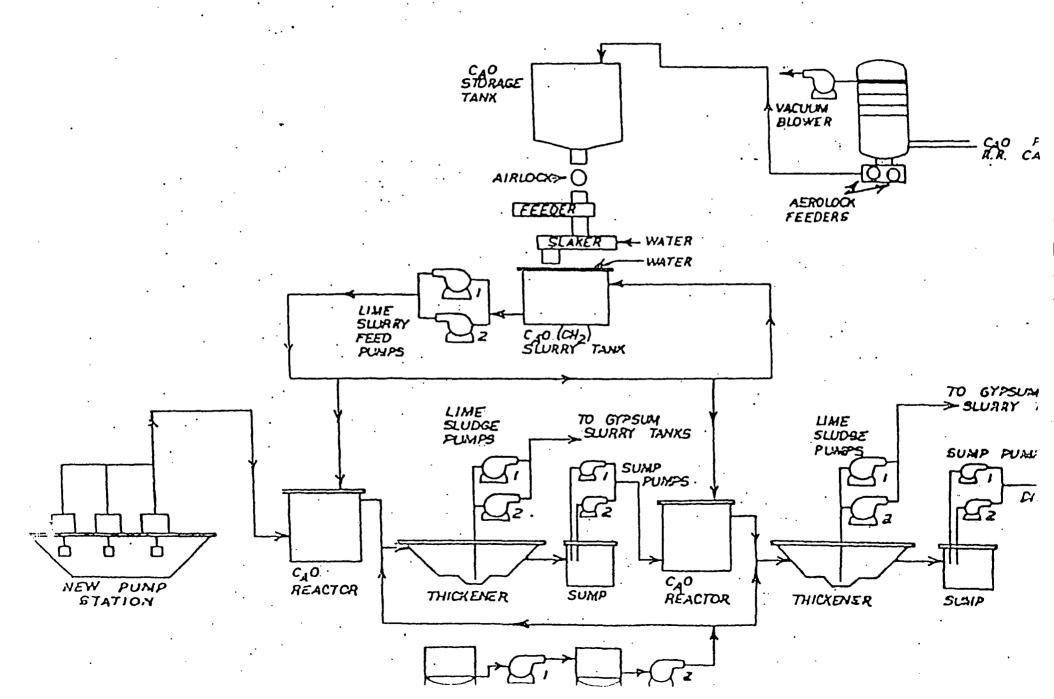
PAGE TWO

MAKES IT ONE OF THE LARGEST IN THE INDUSTRY. ALSO, OUR SCREENING CAPACITY FOR SIZE CONTROL IS VERY LARGE WITH RESPECT TO THE NORMAL AMOUNT OF MATERIAL PUT OVER IT. THE ABILITY TO ACCOMPLISH SUPERIOR DRYING AND SCREENING ALLOWS US TO MAKE A PRODUCT OF EXCELLENT HANDLING AND SHIPPING QUALITY.

MATERIAL RECOVERY PLAYS A SIGNIFICANT PART IN THE EFFICIENCY OF ANY FERTILIZER PLANT. BY INSTALLING A VERY ADVANCED SCRUBBER SYSTEM WE ARE ABLE TO KEEP OUR MATERIAL LOSS AT A MINIMUM. WE HAVE TOTAL OF SIX SEPARATE SCRUBBERS TO INSURE AGAINST THE LOSS OF THE DRY PRODUCT AS DUST, AND GASEOUS EMISSIONS WHICH MIGHT CAUSE POLLUTION. THE RATHER ELABORATE MASS OF DUCTING AND EQUIPMENT ON THE WESTERN SIDE OF THE PLANT MAKE UP THE MAJOR PART OF THE SCRUBBING SYSTEM. THE SIZES AND SHAPES OF THE DUCT WORK ARE ENGINEERED FOR MAXIMUM PERFORMANCE AND THIS SOMEWHAT COMPROMISES THEIR APPEARANCE.

THE PRODUCTS FROM OUR FERTILIZER PLANT MAY, AT TIMES,
BE USED AS FINISHED PRODUCTS, BUT THEIR MAIN USE IS AS
INTERMEDIATE PRODUCTS FOR USE IN THE PRODUCTION OF OTHER
GRADES OF FERTILIZER, MUST OF THE MATERIAL IS EXPORTED, BUT
IT COULD BE SHIPPED TO FERTILIZER PLANTS IN THE UNITED
STATES.

Royster WATER TREATMENT --- DOUBLE LIMING SYSTEM



WATER TREATMENT

IN THE PRODUCTION OF PHOSPHORIC ACID AND PHOSPHATE FERTILIZER, GASSES AND PARTICULATES (DUST OR LIQUID DROPLETS) ARE EMITTED TO THE ATMOSHPERE. THESE EMITANTS ARE CAPTURED IN WATER STREAMS WITHIN SO-CALLED SCRUBBERS. THIS WATER IS RECIRCULATED AND REUSED IN THE VARIOUS PRODUCTION PROCESSES.

PART OF THE PRODUCTION CYCLE IS THE REMOVAL OF GYPSUM FROM PHOSPHORIC ACID BY FILTRATION. THE GYPSUM COMES OFF THE FILTER AS A SOLID AND IN OUR SYSTEM IS SLURRIED WITH WATER TO BE REMOVED FROM THE PLANT TO A GYPSUM STACKING AREA. HERE THE WATER IS ALLOWED TO SEPARATE FROM THE GYPSUM AND FORMS THE RECIRCULATION WATER FOR REUSE IN THE PRODUCTION OF PHOSPHATE PRODUCTS. ONCE WATER HAS COME INTO CONTACT WITH EITHER THE GASEOUS EMISSIONS, DUST, OR GYPSUM IT IS THEN CONTAMINATED AND CANNOT BE RELEASED FROM THE PLANT SITE. THEREFORE IT IS NECESSARY TO HAVE LARGE HOLDING PONDS THAT CAN CONTAIN SEVERAL MILLION GALLONS OF WATER.

DURING MOST YEARS ALL WATER REQUIREMENTS FOR THE PHOSPHORIC ACID COMPLEX CAN BE SATISFIED BY THE RAINFALL EYAPORATION BALANCE ON THE POND SYSTEM, HOWEVER, DURING SOME RAINY PERIODS THE WATER LEVELS IN THE PONDS MAY EXCEED THE VOLUMES ESTABLISHED FOR WATER CONTAINMENT. THIS CRITICAL LEVEL IS DETERMINED BY THE AMOUNT OF STORAGE NEEDED TO CONTAIN HIGH RAINFALL EVE ITS (UP TO 10 INCHES IN 24 HOURS).

WATER TREATMENT

PAGE TWO

IN ORDER TO MAINTAIN THE WATER LEVEL BELOW THIS POINT, WATER TREATMENT FACILITIES MUST BE AVAILABLE. TREATMENT MUST TAKE WATER THAT HAS A PH OF BELOW = 3.0 AND CONTAINS LARGE AMOUNTS OF FLUORIDE AND PHOSPHORUS, AND NEUTRALIZE IT TO A PH OF 6.0 - 9.0, AND REDUCE THE FLUORIDE AND PHOSPHORUS LEVELS TO JUST A FEW PARTS PER MILLION. THE EQUIPMENT NECESSARY TO DO THIS IS CALLED A "DOUBLE LIMING" FACILITY AND INVOLVES A TWO STAGE TREATMENT OF THE WATER. THE LIME COMES INTO THE PLANT AS PEBBLE, IT IS THEN PREPREACTED WITH WATER (THIS IS CALLED SLAKING) AND SLURRIED WITH MORE WATER TO MAKE IT SUITABLE FOR WATER NEUTRALIZATION.

IN THE FIRST STAGE, LIME SLURRY AND CONTAMINATED

WATER ARE MIXED TO REMOVE THE FLUORIDE. THE SOLID MATERIAL

FORMED SETTLES FROM THE MIXTURE. THE WATER FROM THIS

STAGE THEN IS REACTED WITH MORE LIME SLURRY, IN A DIFFERENT

VESSEL, FORMING MORE SOLIDS TO REMOVE THE PHOSPHORUS. IN

EACH STAGE SOLIDS ARE FORMED AND MUST BE MECHANICALLY RE
MOVED TO PREVENT THEM FROM RECONTAMINATING THE WATER. THE

SOLIDS ARE DISPOSED WITH THE GYPSUM INTO THE STACKING AREA.

THE TREATED WATER IS THEN SENT TO A HOLDING POND FOR FINAL

CLARIFICATION BY SETTLING. IT IS PURE ENOUGH TO BE RELEASED

TO THE RECEIVING BODY OF WATER, IN OUR CASE, A SALT WATER

ESTUARY. EACH STAGE OF THE LIMING PROCESS IS MONITORED

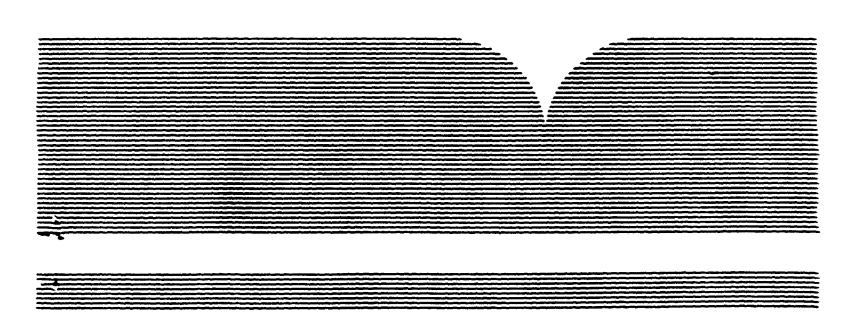
FOR PH WITH THE FINAL WATER BEING MONITORED THREE TIMES

FOR PH AND CONTAMINATES BEFORE IT IS RELEASED.

REPORT TO CONGRESS ON SPECIAL WASTES FROM MINERAL PROCESSING - SUMMARY AND FINDINGS METHODS AND ANALYSES APPENDICES

(U.S.) Environmental Protection Agency Washington, DC

Jul 90



U.S. DEPARTMENT OF COMMERCE National Technical Information Service

United States
Environmental Protection
Agency

Solid Waste and Emergency Response (OS-305)

EPA/530-SW-90-070C July 1990

♣EPA Report to Congress on Special Wastes from Mineral Processing

Summary and Findings Methods and Analyses Appendices

> REPRODUCED BY U.S. DEPARTMENT OF COMMERCE NATIONAL TECHNICAL INFORMATION SERVICE SPRINGFIELD, VA. 22161

Chapter 12 Phosphoric Acid Production

The phosphoric acid production industry consists of 21 facilities that were active as of September 1989, employed the wet phosphoric acid production process, and generated two special wastes from mineral processing: process wastewater and phosphogypsum. The data included in this chapter are discussed in additional detail in a technical background document in the supporting public docket for this report.

12.1 Industry Overview

There are two processes for producing phosphoric acid: (1) the wet process, which is a mineral processing operation and is studied here, and (2) the furnace process. Furnace process phosphoric acid production uses elemental phosphorus rather than beneficiated phosphate rock as a feedstock and, therefore, wastes generated by the process are not mineral processing special wastes according to the Agency's definition of mineral processing. Consequently, furnace process production of phosphoric acid is not within the scope of this report.

About 95 percent of the commercial phosphoric acid produced by the wet process is used in the production of fertilizers and animal feed, with a small portion used as a feedstock in chemical processing operations.² Typically, the fertilizer and feed plants are co-located with the phosphoric acid facilities.

As shown in Exhibit 12-1, the majority of the 21 active wet process facilities are located in the southeast, with 12 in Florida, three in Louisiana, and one in North Carolina. Production data and dates of initial operation and modernization were provided by all 21 facilities, although two claimed confidential status for their information. The dates of initial operation for the 19 non-confidential facilities ranges from 1945 to 1986.³ Most of these facilities have undergone modernization within the last ten years, although six facilities have not been upgraded in over 20 years. The 19 reporting non-confidential facilities have a combined annual production capacity of over 11 million metric tons and a 1988 aggregate production of nearly 8.5 million metric tons; the 1988 capacity utilization rate, therefore, was approximately 77 percent. Several facilities, however, operated at low utilization rates (i.e. three facilities reported rates of 15.8, 30.1 and 37.5 percent).

The fertilizer industry, the largest user of phosphoric acid, suffered poor financial conditions for much of the 1980s. These conditions were the result of low domestic demand and reduced foreign buying. Domestic demand for phosphoric acid was boosted by the 1988 recovery of the farm economy and was expected to continue to grow as crop prices and planted acreage increased in 1989. Non-fertilizer uses of phosphoric acid declined during the 1980s due to strict regulations governing the use of phosphates in household products and a decline in industrial demand.⁴

The wet process consists of three operations: digestion, filtration, and concentration, as shown in Exhibit 12-2.⁵ Beneficiated phosphate rock is dissolved in phosphoric acid; sulfuric acid is added to this solution and chemically digests the calcium phosphate. The product of this operation is a slurry that consists

¹ At least two facilities were on standby in 1988, Agrico's Ft. Madison, lowe and Haknville (Taft), Louisians facilities; they are not included in this analysis.

² Bureau of Mises, 1987. <u>Minerals Yearbook</u>, 1987 Ed., p. 676.

³ Phosphoric acid producers, 1989. Company Responses to the "National Survey of Solid Wasters from Mineral Processing Facilities," U.S.EPA, 1989.

Standard & Poor's, "Chemicals: Basic Analysis," <u>Industry Serveys</u>, October 13, 1988 (Section 3), p. C20.

⁵ Environmental Protection Agency, 1986. <u>Evaluation of Watte Management for Photophate Processing</u>. Prepared by PEI Associates for U.S. EPA, Office of Research and Development, Cinconnau, OH, August, 1986.

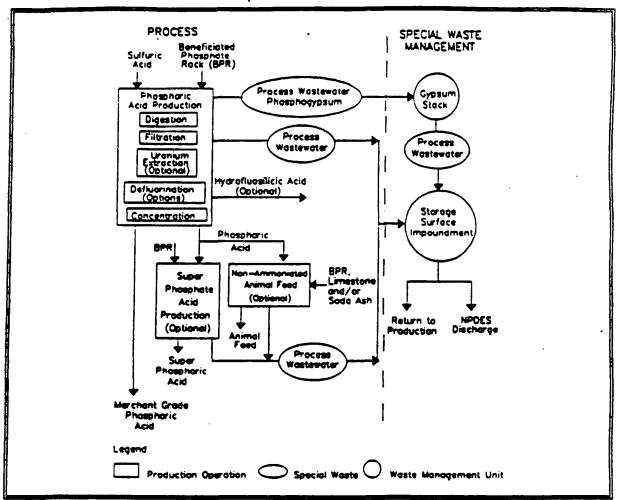


Exhibit 12-2
Phosphoric Acid Production

12.2 Waste Characteristics, Generation, and Current Management Practices

12.2.1 Phosphogypsum

Phosphogypsum, which has an average particle diameter of less than 0.02 millimeters, is primarily composed of calcium sulfate, silicon, phosphate, and fluoride. It also typically contains a variety of radionuclides, including uranium-230, uranium-234, thorium-230, radium-226, radon-222, lead-210 and polonium-210.

Using available data on the composition of phosphogypsum, EPA evaluated whether leachate from this material exhibits any of the four characteristics of hazardous waste: corrosivity, reactivity, ignitability, and extraction procedure (EP) toxicity. Based on available information and professional judgment, the Agency does not believe phosphogypsum is reactive, corrosive, or ignitable. Some phosphogypsum samples, however, exhibit the characteristic of EP toxicity. EP leach test concentrations of all eight inorganic constituents with EP toxicity regulatory levels are available for 28 phosphogypsum samples from 11 facilities of interest. Of these constituents, only chromium concentrations exceed the EP toxicity levels; this occurred in 2 of 28 samples analyzed, by as much as a factor of 9. Both samples that failed the EP toxicity criterion for chromium

of 2.7) in only 3 samples (2 of which were from the Pocatello facility and 1 from the Pascagoula facility). SPLP leach test results for phosphoric acid process wastewater samples were well below the EP toxicity regulatory levels for all constituents.

Non-confidential waste generation rate data were fully reported for process water by 12 of the 21 processing facilities and estimated for the remaining nine. The aggregate annual industry-wide generation of process water was approximately 1.77 billion metric tons (468 billion gallons) in 1988, yielding a facility average of 84 million metric tons per year (60 million gallons per day [mgd]). Reported facility annual generation rates ranged from 13 to 280 million metric tons of process wastewater (9.3 to 200 mgd). The ratio of process water managed to phosphoric acid produced ranges from 102 to 494.

The process wastewater from the stacks, along with non-transport process waters, are typically managed in on-site impoundments, commonly known as cooling ponds. These impoundments are used in conjunction with the gypsum stacks in an integrated system. Water from these ponds is reused in on-site mineral processing and other activities. The facility operators ideally seek to maintain a water balance such that no treatment and discharge of process wastewater to surface water is necessary, although some facilities are equipped to treat and discharge some wastewater during periods of high precipitation.

The average dimensions of the cooling ponds are nearly 60 hectares (145 acres) of surface area and 2.6 meters (8.5 feet) of depth; on a facility-specific basis the surface area ranges from 1 to 260 hectares (2.5 to 640 acres) and depth ranges from 0.3 to 6.7 meters (1 to 21 feet).

12.3 Potential and Documented Danger to Human Health and The Environment

This section addresses two of the study factors required by \$8002(p) of RCRA: (1) potential danger (i.e., risk) to human health and the environment; and (2) documented cases in which danger to human health or the environment has been proven. The Agency's evaluation of the potential dangers posed by phosphogypsum and phosphoric acid process wastewater uses the evidence presented in numerous documented cases of danger to human health and the environment to establish that these wastes can threaten human health and the environment as they are currently managed. Overall conclusions about the hazards associated with phosphogypsum and phosphoric acid process wastewater are provided after these two study factors are discussed.

12.3.1 Risks Associated With Phosphogypsum and Phosphoric Acid Process Wastewater

Any potential danger to human health and the environment from phosphogypsum and phosphoric acid process wastewater depends on the presence of toxic and radioactive constituents in the wastes that may present a hazard and the potential for exposure to these constituents. The Agency has documented cases of dangers posed by these wastes via ground and surface water pathways (see Section 12.3.2), and has previously evaluated potential air pathway dangers from the management of phosphogypsum in stacks. Based on the insights provided by analyses of the hazards posed by phosphogypsum and phosphoric acid wastewater, and information on waste characteristics and management developed for this study, the Agency evaluated the intrinsic hazard of these wastes and the potential for toxic and radioactive constituents from these wastes to pose threats to human health and the environment. This evaluation discusses constituents of potential concern in the wastes and assesses the management practice and environmental setting characteristics that affect the potential for these wastes to pose risks through the ground-water, surface water, and air pathways.

Phosphogypsum Constituents of Potential Concern

EPA identified chemical constituents in phosphogypsum that may present a hazard by collecting data on the composition of this waste and evaluating the intrinsic hazard of the chemical constituents.

29 / 43

1/8

Potential Constituents of Concern	No. of Times Constituent Detected/No. of Analyses for Constituent	Human Health Screening Criteria ^(M)	No. of Analyses Exceeding Criteria/ No. of Analyses for Constituent	No. of Facilities Exceeding Criteria/ No. of Facilities Analyzed for Constituent
Redium-226	29 / 29	Redistion*(E)	26 / 29	6/7
Uranium-238	18 / 18	Rediction*ItI	1 / 18	1/3
Chromium	34 / 43	inhelation	0/43	4/8
Arsenic	35 / 43	ingestion"	-34/43	2/8

Exhibit 12-3
Potential Constituents of Concern in Phosphogypsum Solids^(a)

- (a) Constituents listed in this table are present in at least one sample from at least one facility at a concentration that exceeds a relevant screening criterion. The conservative screening criteria used in this analysis are listed in Exhibit 2-3. Constituents that were not detected in a given sample were assumed not to be present in the sample.
- (b) Human health ecreening criteria are based on exposure via incidental ingestion and inhalation. Human health effects include cancer risk and noncancer health effects. Screening criteria noted with an *** are based on a 1x10** lifetime cancer risk; others are based on noncancer effects.
- (c) Includes direct radiation from contaminated land and inhalation of radion decay products.

facilities analyzed. None of these constituents, however, exceed the screening criteria by more than a factor of 10.

- Radium-226, and uranium-238 concentrations exceed health-based screening criteria based on multiple radiation pathways. Exceedance of these criteria indicates that phosphogypsum could pose an unacceptable radiation risk if used in an unrestricted manner (for instance, direct radiation doses and doses from the inhalation of radon could be unacceptably high if phosphogypsum is used around homes).
- Chromium and arsenic concentrations exceed the health-based screening criteria for inhalation. This indicates that these constituents could pose a significant cancer risk (i.e., greater than 1x10⁻⁵) if phosphogypsum were released to the ambient air as particles.
- Arsenic concentrations exceed the health-based screening criteria for incidental ingestion. This indicates that arsenic may pose a significant incremental lifetime health risk (i.e., greater than 1x10⁻⁵) if a small quantity of phosphogypsum or soil contaminated with phosphogypsum is inadvertently ingested on a routine basis (e.g., airborne waste particles may be deposited on crops, or small children playing on abandoned stacks could inadvertently ingest the waste).

EPA sampling and analysis also indicates that levels of gross alpha and beta radiation from phosphogypsum are very high (10 to 100 pCl/g) relative to levels associated with typical soils (approximately 1 pCl/g).

Based on a comparison of leach test concentrations of 29 constituents to surface and ground-water pathways screening criteria (see Exhibit 12-4), 17 constituents were found to be of potential concern for water-based release and exposure. Among these 17 constituents, phosphorus, arsenic, lead, phosphate, manganese, molybdenum, and nickel exceed screening criteria in at least one-half of all facilities analyzed. Twelve constituents exceed the screening criteria by more than a factor of 10, but only chromium was measured in concentrations that exceed the EP toxicity regulatory level. All of these constituents are very persistent in the environment.

These exceedances of the screening criteria have the following implications:

- Concentrations of arsenic, lead, cadmium, chromium, fluoride, zinc, antimony, copper, and thallium in phosphogypsum leachate exceed screening criteria based on human health risks. This indicates that, if phosphogypsum leachate were diluted less than 10-fold during migration to a drinking water exposure point, long-term chronic ingestion could cause adverse health effects due to the presence of these constituents. The concentration of arsenic in diluted phosphogypsum leachate could pose a cancer risk of greater than 1x10-5 from long-term drinking water exposures.
- Concentrations of phosphorus, lead, phosphate, nickel, iron, cadmium, chromium, silver,
 zinc, copper, and mercury in phosphogypsum leachate exceed screening criteria for protection of aquatic life. This means that phosphogypsum leachate could present a threat to aquatic organisms if it migrates (with less than 100-fold dilution) to surface waters.
- Lead, manganese, molybdenum, nickel, iron, cadmium, chromium, zinc, and copper
 concentrations in phosphogypsum leachate exceed ground and surface water resource
 damage screening criteria. This indicates that, if released and diluted by a factor of 10
 or less, leachate from this waste may contain these constituents in concentrations
 sufficient to severely restrict the potential future uses of nearby ground and surface
 water resources.

These exceedances of the screening criteria, by themselves, do not demonstrate that phosphogypsum poses a significant risk, but rather indicate that it may present a hazard. To determine the potential for phosphogypsum to cause significant impacts. EPA proceeded to analyze the actual conditions that exist at the facilities that generate and manage the waste (see the following section on release, transport, and exposure potential).

Process Wastewater Constituents of Potential Concern

Using the same process summarized above for phosphogypsum, EPA identified chemical constituents in phosphoric acid process wastewater that could conceivably pose a risk by collecting data on the composition of this waste, and evaluating the intrinsic hazard of the chemical constituents present in the process wastewater.

Data on Process Wastewater Composition

EPA's characterization of process wastewater and its leachate is based on data from: (1) a 1989 sampling and analysis effort by EPA's Office of Solid Waste (OSW), and (2) industry responses to a RCRA §3007 request. These data provide information on the concentrations of 21 metals, radium-226, uranium-238, gross alpha and gross beta radiation, a number of other inorganic species (i.e., chloride, fluoride, phosphate, nitrate, sulfate, and ammonia), and seven organic compounds in total and leach test analyses. Data on the pH of process wastewater was also collected: at most facilities, the pH is between 1 and 2 standard units, however, two facilities report minimum levels below 1, and 1 facility reports levels between 6.5 and 8 standard units. The waste composition data represent samples collected from 17 of the 21 active phosphoric acid production facilities. As with the concentration data for phosphogypsum, data on the concentrations of most constituents in process wastewater vary over two or three orders of magnitude. Concentrations from leach test analyses of the wastewater vary to a smaller extent.

Concentrations of most (i.e., 22 of 40) constituents in sotal analyses of process wastewater vary considerably among the samples analyzed (i.e., the range of values spans more than three orders of magnitude). Concentration data provided by industry represent a larger number of samples and span a wider range of values than do data from EPA's sampling and analysis efforts. Concentrations of most constituents in leach test analyses of process wastewater vary considerably less than do concentrations in total analyses (i.e., the ranges of values span two or three orders of magnitude for only five constituents). Because the waste

Exhibit 12-5
Potential Constituents of Concern in Phosphoric Acid Process Wastewater (Total) (a)

Poterrtial Constituents of Concern	No. of Times Constituent Detected/No. of Analyses for Constituent	Screening Criteria ^(b)	No. of Analyses Exceeding Criteria/ No. of Analyses for Constituent	No. of Facilities Exceeding Criteria/ No. of Facilities Analyzed for Constituent
Arsenic	77 / 78	Human Health' Resource Demage Aquetic Ecological	76 / 78 37 / 78 21 / 78	15 / 15 8 / 15 5 / 16
Phosphorus	31 / 31	Aquatic Ecological	31 / 31	10 / 10
Phosphate	30 / 38	Aquatic Esological	36 / 38	9/9
Cadmium	73/17	Human Health Resource Damage Aquatic Ecological	65 / 77 69 / 77 68 / 77	14 / 15 14 / 15 14 / 15
Chromium	75 / 78	Human Health Passures Damage Aquatic Ecological	26 / 76 65 / 76 44 / 78	8/15 14/15 9/15
Aluminum	58 / 59	Resource Damage Aquatic Ecological	42 / 50 53 / 50	8 / 10 10 / 10
Green Alpha	46/47	Resource Damage	40 / 47	11 / 11
Gross Bets	34 / 47	Resource Demage	30 / 47	9/9
Redium-228	86/80	Human Health Resource Derringe	25 / 85 14 / 85	9 / 13 6 / 13
Phenol	4/5	Resource Damage	4/5	3/3
Iron	64 / 95	Resource Derrege Aquatic Esological	52 / 55 53 / 55	10 / 10 6 / 10
Manganese	44/44	Resource Damage	41 / 44	10 / 10
Nickel	9173 ;	Resource Demage Aquatic Encloyical	14/72 57/72	8/14. 12/14
Lead	64 / 75	Human Health Researce Damage Aquatic Esological	26 / 75 51 / 76 22 / 75	6/15 12/15 7/15
Venedlum 1 attender 4	33)-0	Hamen Health Receives Damage	**************************************	8/10 9/10
Sulfate	57 / S7	Resource Damage	43 / 57	10 / 11
Соррег	nar (- 1 40 / 74)a. See ozname z ija _{kap} e	Human Health Resource Darrage Aquatic Sociegical	1 / 74 1 / 74 22 / 74	1 / 14 1 / 14 7 / 14

⁽a) Constituents listed in this table are present in at least one sample from at least one facility at a concentration that exceeds a relevant concerning enterior. The operaryative severaling enterior used in this analysis are listed in Eshibit 2-3. Constituents that were not detected in a given sample were assumed not to be present in the sample.

Constituents that were not detected in a given comple were assumed not to be present in the comple.

(b) Human health coreoning oritoria are based on concer risk or nonconcer health effects. "Flumen health' coreoning criteria noted with an ** are based on 1x10* Biotime concer risk; others are based on nonconcer effects.

Ground-Water Release, Transport, and Exposure Potential

Section 12.3.2 describes documented cases of ground-water contamination at seven phosphoric acid plants located in Central Florida (3), Louisiana (2), North Carolina (1), and Idaho (1). These cases indicate that phosphogypsum and process wastewater constituents have been released to ground water at a number of facilities and, at some sites, have migrated off-site to potable wells in concentrations that are well above hazard criteria. Based on the analysis of the damage case evidence, presented below, EPA concludes that management of phosphogypsum and process wastewater in stacks and ponds can release contaminants to the subsurface, and depending on the hydrogeologic setting and ground-water use patterns, threaten human health via drinking water exposures or render ground-water resources unsuitable for potential use.

In the following paragraphs, EPA presents a region-by-region assessment of the hazards posed by phosphogypsum and process wastewater management. For purposes of this discussion, phosphoric acid plants are grouped into the following eight regions: Central Florida, North Carolina, Louisiana, Idaho, North Florida, Mississippi, Texas, and Wyoming. For each region for which ground-water damages have been documented, the Agency first builds the case that damages attributable to waste management have occurred, then, to the extent necessary, uses environmental setting information to assess the potential hazards (i.e., health risks and resource damage potential) at other facilities in the region. When no damage case information is available for a region, evidence of release potential is used in conjunction with environmental setting information to assess the hazards of potential releases from the plants in these regions.

Central Florida. The Florida Department of Environmental Regulation has initiated enforcement actions in response to ground-water contamination associated with the management of phosphogypsum and process wastewater at all 11 active phosphoric acid production facilities in Central Florida. At three of these facilities (i.e., Central Phosphates, Seminole, and IMC) contamination of the useable intermediate or Floridan aquifers exceeds primary drinking water standards for pH, gross alpha radiation, radium, sodium, total dissolved solids, sulfate, cadmium, chromium, fluoride, and arsenic beyond the permitted zone of discharge. With the exception of sodium and total dissolved solids, all of these constituents were identified as potential constituents of concern in phosphogypsum or process wastewater. At the other eight facilities, contamination exceeding drinking water standards beyond the permitted zone of discharge has been detected only in the surficial aquifer. Two of the three damage cases for Central Florida phosphoric acid production plants presented in Section 12.3.2 (i.e., Central Phosphates and Seminole) discuss contamination of off-site ground water in formations that are used for water supplies. At Central Phosphates, a ground-water contamination plume in the Floridan aquifer extends six acres beyond the facility boundary; contamination of the surficial aquifer covers 28 acres outside the facility boundary. Twelve of 18 potable supply wells down-gradient of the Seminole plant sampled in 1988 contained at least one constituent at a concentration in excess of a drinking water standard. The owner of the phosphoric acid plant paid to have the affected properties connected to a public water supply. These ground-water contamination incidents indicate a high potential for ground-water releases from the phosphoric acid production plants in Central Florida. Except for the Gardinier facility, all operating plants in this area are within 1,000 meters of a public supply well and contamination of the Floridan aquifer at these sites could pose a public health threat via drinking water exposures. As demonstrated by the damage cases and violations of drinking water standards beyond the permitted zone of discharge, contaminants from these wastes can reach the useable aquifer in this area and migrate down-gradient toward potential exposure points.

North Carolina. Section 12.3.2 discusses ground-water contamination resulting from management of process wastewater at the phosphoric acid plant in Amora, North Carolina. The extent of ground-water contamination at this site is not known with certainty, but fluoride and total dissolved solids concentrations in on-site wells exceed state drinking water standards in the surficial aquifer that is not extensively used and

⁷ The State of Florida allows discharges to ground water within a defined "zone of discharge." The horizontal extent of the zone typically is limited to the property boundary.

this plant could result in exposures at a residence located 180 meters down-gradient. Ground-water contamination potential appears high at the Pascagoula plant in Mississippi because ground water occurs at a depth of only 1.5 meters in this area. Human populations are not likely to be exposed to potential ground-water contaminants at this facility, however, because currently there are no residences or public supply wells within 1,600 meters down-gradient from the facility.

Texas and Wyoming. The potential for ground-water pathway risks at the Texas and Wyoming facilities is relatively low. Releases from the management units at the plant in Pasadena, Texas are limited to some extent because the stack at this facility is lined with recompacted local ciay, and exposures to existing populations are unlikely because there is no residence or public supply well within 1.600 meters down-gradient from the facility. Similarly, the facility in Rock Springs, Wyoming poses a relatively low risk because its stack has a synthetic liner and the nearest down-gradient residence is quite distant (greater than 1.600 meters).

Surface Water Release, Transport, and Exposure Potential

The potential for the release of contaminants from phosphogypsum stacks and process wastewater ponds to surface water is also demonstrated by the damage cases presented in Section 12.3.2. These cases indicate that phosphogypsum and process wastewater management at plants in Central Florida, North Carolina, and Louisiana has resulted in the release of waste constituents to surface waters. Based on the analysis of the damage case evidence, it is clear that management of phosphogypsum and process wastewater in stacks and ponds can, and does, release contaminants to nearby surface waters. Depending on the distance to surface waters, the hydrogeologic setting, and surface water use patterns, EPA concludes that there is a potential for these released contaminants to migrate off-site and threaten human health via drinking water exposures, threaten aquatic life, or render surface water resources unsuitable for potential consumptive uses.

In the following paragraphs, EPA presents a region-by-region assessment of the hazards to surface water quality posed by phosphogypsum and process wastewater management. For each region for which surface water releases have been documented, the Agency first builds the case that releases from waste management units have occurred in the past and are typical of current practices, then uses environmental setting information to assess the potential hazards (i.e., health risks, risk to aquatic organisms, and resource damage potential) at other facilities in the region. When no damage case information is available for a region, evidence of release potential is used in conjunction with environmental setting information to assess the hazards of potential releases from the plants in these regions.

Central Florida. The damage cases presented in Section 12.3.2 indicate that unpermitted discharges of process wastewater and/or phosphogypsum stack seepage to surface waters have occurred at the Gardinier and Seminole plants in Central Florida. At the Gardinier facility, a number of releases from 1984 to 1988 have been documented. Releases to surface water from solid waste management at this plant arise from the discharge of untreated stack seepage from a drain system that is designed to intercept and collect leachate and effluent flowing laterally away from the stack. As indicated in the damage cases, fluorides, phosphorus, and radioactive substances are present at concentrations of concern in the effluent from this drain system. In addition, these unpermitted discharges had a pH of 1.5 to 2.2. In 1968, county and state inspectors discovered damaged vegetation on the shoreline of Hillsborough Bay along the west side of the gypsum stack where an unpermitted discharge was occurring. The affected area — approximately one-half acre of saltwater marshes and wax myrtle — had turned a brownish color, ¹⁰ presumebly as a result of the discharge of untreated stack seepage. At the Seminole facility, surface water contamination has occurred via an unpermitted discharge to Bear Branch. Similar releases, or releases of contaminated ground-water discharging to surface water, could also occur at the eight other facilities in this area that are located near surface waters. At two of these

¹⁹ Hillsborough County Environmental Protection Commission. October 6, 1988. Memorandum from Roger Stewart, Director. to Page Iono, Commissioner.

assessment. OAR estimates that the lifetime cancer risk to the maximally exposed individual (MEI) caused by the inhalation of radon in the vicinity of a phosphogypsum stack is $9x10^{-5}$. The MEI lifetime cancer risk from radon inhalation is greater than or equal to $1x10^{-5}$ at 17 of the 21 active phosphoric acid facilities. Only the plants in Pascagoula, Mississippi; Aurora, North Carolina; Rock Springs, Wyoming; and White Springs. Florida have an estimated MEI lifetime cancer risk from radon inhalation of less than $1x10^{-5}$.

Because phosphogypsum forms a crust on inactive areas of the stack as it dries, and because the active areas of the stack are moist, the emission of particulate matter by wind erosion is not thought to be a significant release mechanism. 12 Physical disturbance of dried phosphogypsum (e.g., by vehicles driving over the stacks), however, may be an important particle release mechanism. The OAR risk assessment estimated that the lifetime cancer risks from radionuclides in particle emissions from stacks range from $8x10^{-8}$ to $2x10^{-6}$. Based on these risk estimates, the OAR assessment concludes that the risk from inhaling radon emitted from phosphogypsum stacks is approximately two orders of magnitude greater than the cancer risk posed by the inhalation of fugitive dust from phosphogypsum stacks.

The OAR study did not investigate the cancer risk posed by other toxic constituents (i.e., arsenic and chromium) in phosphogypsum via particle inhalation. To supplement OAR's radiological assessment, EPA performed a screening level analysis of the risks posed by arsenic and chromium blown from phosphogypsum stacks. Using typical concentrations of arsenic and chromium in phosphogypsum, EPA calculated a lifetime cancer risk of $7x10^{-7}$ from exposure to these constituents in windblown phosphogypsum.¹³ This analysis shows that the risk posed by arsenic and chromium in inhaled phosphogypsum particles is on the order of 35 percent of the risk posed by radionuclides in inhaled particles.

Based on the these findings, the Agency concludes that phosphogypsum stacks pose a considerable air pathway cancer risk primarily as a result of radon emissions from the stacks. By summing the risk estimates for radon inhalation, radionuclides in phosphogypsum particles, and arsenic and chromium in particles. EPA estimates a total air pathway lifetime MEI cancer risk of approximately $9x10^{-5}$ from exposure to phosphogypsum constituents. This risk is primarily from inhalation of radon emitted from stacks $(9x10^{-5})$ with minor contributions from the inhalation of phosphogypsum particles containing radionuclides $(2x10^{-5})$ and arsenic and chromium $(7x10^{-7})$. Based on the OAR estimates of risk from radon emitted from the stacks, the following plants appear to pose the greatest air pathway risks: Pasadena, Texas; Royster/Palmetto; Uncle Sam, Louisiana; Seminole; Central Phosphate; and Carlbou, Idaho. As mentioned above, the stacks at Pascagoula, Mississippi; Aurora, North Carolina; Rock Springs, Wyoming; and White Springs, Florida pose lower MEI lifetime cancer risk (i.e., $< 1x10^{-5}$).

Proximity to Sensitive Environments

Eighteen of the 21 active U.S. phosphoric acid plants are located in or near environments that are vulnerable to contaminant release or that have high resource value. In particular:

- The Seminole facility reported in its response to the National Survey on Solid Wastes from Mineral Processing Pacilities that it is located in an endangered species habitat.
- The Royster/Paimetto and Pascagoula facilities are located within 6.5 and 7.8 miles, respectively, of the critical habitat of an endangered species. The two endangered species are the Florida Manasee and the Mississippi Sandhill Crane. Because of the

¹² Ibid p 13-2

¹³ This risk estimate is based on a comparison of the dest inhalation risks posed by (1) median assemic and chromism concentrations as determined by EPA's data base developed for this study and (2) average concentrations of radium-234, uranium-234, uranium-238, thorium-230, polonium-210, and land-210 presented in the OAR analysis. To calculate the relative raits posed by these constituent concentrations, EPA assumed an exposure point concentration of windblows phosphogypsum in air, and applied standard cancer slope factors and exposure assumptions, such as those used in developing the screening criteria (see Section 2.2.2), to estimate the relative contributions of carcinogenic metals and radionactides to the salaisation raits posed by surforms phosphosypsum.

12.3.2 Damage Cases

EPA conducted waste management case studies to assess the impacts of phosphogypsum and process wastewater management practices on human health and the environment. This review included 21 active and eight inactive phosphoric acid facilities. The inactive facilities are: Agrico, Hahnville, LA: Agrico, Fort Madison, IA: Albright & Wilson, Fernald, OH: JR Simplot, Helm, CA: Mobil Mining & Minerals, De Pue, IL: U.S. Agri-Chemicals Corp., Bartow, FL: Waterway Terminals, Helena, AR; and MS-Chemical located in Pascagoula, Mississippi. Documented damages attributable to management of phosphogypsum or process wastewater have been documented at more than ten facilities. Selected facilities are discussed in detail below.

Several factors play an important role in influencing the effectiveness of typical phosphogypsum and process wastewater management practices. Among these are water balance and soil stability. In Florida, for example, phosphogypsum dewatering and reduction of wastewater volumes are made possible due to the climate, specifically the relative amounts of precipitation and evaporation, in this region. In other areas, however, such as Louisiana, a net precipitation surplus necessitates a system dependent on planned discharges to surface waters. Soil stability appears to be much greater in Florida as well, where gypsum may be stacked to heights up to 60 meters (200 feet). In Louisiana, gypsum piles over 12 meters in height are generally considered unstable. In light of these differences, the case studies presented in this section are grouped by state.

idaho

Nu-West Industries-Conda, Soda Springs, Idaho

The Nu-West plant is located approximately five miles north of Soda Springs, Idaho, near the abandoned mining town of Conda. The site covers approximately 650 hectares (1,600 acres). With the exception of a period from 1985 to 1987, the plant has been in operation since 1964.

Currently, Nu-West formulates and markets phosphate-based chemicals and fertilizers. The phosphogypsum waste is a by-product of the digester system, which produces ortho-phosphoric acid (P_2O_5) from phosphate ore. Gypsum is slurried with process water and pumped to two storage ponds on top of the gypsum stacks, which have been in use since 1964 and presently cover approximately 240 to 280 hectares (600 to 700 acres). The gypsum ponds are unlined; the stacks are about 46 meters (150 feet) above the natural ground surface. Drainage systems decant slurry water off the top of the higher ponds into ponds at lower elevations.

During March 1976, a dike surrounding the Nu-West cooling pond failed and released 400 acre feet of wastewater into the surrounding area. The water spread out and ponded on an estimated 20 to 40 hectares (50 to 100 acres) of farm land. The water then migrated via a natural drainage path, forming a small river that extended four miles to the south. Wastewater reportedly infiltrated into local soil and underlying bedrock along its overland migration path, but never entered a natural surface water body.

While the Idaho Division of Environment determined that dilution during spring run-off reduced surface concentrations of contaminants to within acceptable limits, the Caribou County Health Department recorded significant increases in ground-water concentrations of phosphate, cadmium, and fluoride immediately following the spill. Samples from a J.R. Simplot Company (Conda Operation) production well No. 10, located down-gradient from the Nu-West facility, show that before the spill occurred, levels of phosphate in the ground water averaged 100 mg/L, and rose to 1,458 mg/L after the spill. Levels of cadmium in the ground water averaged 0.01 mg/L before the spill and 0.239 mg/L after the spill, and levels of fluoride averaged 5 mg/L before, and 39 mg/L after, the spill, respectively. 14

¹⁴ EPA Region 10. 1988. Site Inspection Report to Nu-West Industries Conda Plant, Caribou, Idaho. TDD F10-8702-08. March, 1988.

Gardinier's on-site waste management units include two process water ponds (Nos. 1 and 2) and a gypsum stack. Process Water Pond No. 1 is an unlined pond that occupies 13 hectares (32 acres) and is 2 meters (6 feet deep); Process Pond No. 2 occupies 80 hectares and is 2.1 meters deep. The gypsum stack, which as of December 31, 1988 contained about 58 cubic meters (76 million cubic yards) of material, occupies an area of 150 hectares and is 61 meters high. The ponds on top of the gypsum stack occupy 16 hectares and are 2 meters deep. The typical pH of the liquid in the gypsum stack ponds is 1.8.20

Phosphogypsum is piped to the gypsum stack as a slurry mixture (approximately 30 percent solids). The gypsum settles from the slurry and the liquid is decanted for reuse in the manufacturing process. Water which seeps through the stack is collected in a perimeter drain that is buried at the toe of the stack. The drain carries the seepage water to a sump in the northeast corner of the gypsum stack where it is pumped to an evaporation pond located on part of the gypsum stack. Surface water run-off from the exterior slopes of the stack is discharged into Hillsborough Bay. 21

Records at the Hillsborough County Environmental Protection Commission (HCEPC) cite environmental incidents at the Gardinier facility as far back as November 21, 1973, when HCEPC investigated a citizen's complaint and discovered 210 dead crabs in traps placed near the facility's northwest outfall. The pH of the outfall water was 2.9. 22.23

Water quality violations attributable to Gardinier resulted in the following administrative actions: a Consent Order negotiated between the HCEPC and Gardinier on August 22, 1977; a Citation to Cease Violation and Order to Correct from HCPEC on November 8, 1984; a Warning Notice from the State of Florida Department of Environmental Regulation (FDER) on April 9, 1987; a Citation to Cease and Notice to Correct Violation from the HCEPC on May 26, 1988; and, a Warning Notice from FDER on October 18, 1988. These administrative actions were issued to Gardinier following unpermitted discharges from either the gypsum stack or the cooling water ponds.

The November 8, 1984 citation was issued for an untreated effluent discharge which occurred on October 8, 1984. The citation notes that "toe-drain effluent contains several thousand milligrams per liter of fluorides and phosphorus and up to 150 pico-curries per liter of radioactive substances. Also, its pH can be as low as 1.5 standard units. A sample of the discharge on March 30, 1987, which resulted in the April 9, 1987 warning notice, shows that the pH was 1.9, total phosphorus was 6,740 mg/L and dissolved fluorides was 4,375 mg/L. HCEPC analyzed a sample of the discharge which resulted in the October 18, 1988 warning notice and reported the following results: pH, 2.2; total phosphorus, >4,418 mg/L; and fluoride, 1,690 mg/L.

The May 26, 1988 citation from HCEPC states that "available agency records indicate a considerable history of incidents of discharge resulting in exceedances of environmental standards and contamination of the air and waters of Hillsborough County. Enforcement in each case required remedial actions intended to

²⁰ Gardineer, Inc. March 29, 1989. National Survey of Solid Wastes from Mineral Processing Facilities.

²¹ Ardames & Associates, Inc. September 23, 1983. Groundwater Monitoring Plan for East Tamps Chemical Plant Complex, Hillsborough County, Florids.

²² Hillsborough County Environmental Protection Commission. May 6, 1988. Gardiniar History.

²³ Hillsborough County Environmental Protection Commission. November 26, 1973. Interoffice Memo from Robert M. Powell to Richard Wilkins.

³⁴ Hillsborough County Environmental Protection Commission. November 8, 1984. Citation to Come Violation and Order to Correct insend to Gerdinier, Inc.

²⁵ Hillsborough County Environmental Protection Commission. March 31, 1987. Notice of Alleged Violation issued to Gardinier. Inc.

²⁶ Florida Department of Environmental Regulation. October 18, 1988. Warning Notice No. WN88-0001TW295WD insued to Gardinaer, Inc.

The CPI plant began operation in December 1965; principal products include phosphate fertilizer, sulfuric acid, and ammonia. Phosphogypsum generated during the production of phosphoric acid is disposed onsite at the company's 170 hectare (410-acre) phosphogypsum stack. A 50 hectare unlined process water cooling pond completely surrounds the gypsum stack. The depth of the cooling pond is 2.4 meters (8 feet). As of December 31, 1988, the unlined gypsum stack was 111 feet high and contained approximately 70,000,000 tons of material. The top of the gypsum stack presently contains 8 ponding areas occupying a total area of approximately 105 hectares. Two designated areas on top of the stack, located in the middle, are used for disposal of non-hazardous waste materials, such as construction and demolition debris and non-hazardous chemicals. The such as construction and demolition debris and non-hazardous chemicals.

Activities at the Central Phosphates site have resulted in ground-water contamination in the surficial and upper Floridan aquifers. To date, it has been determined that the surficial aquifer and, to an undetermined extent, the Floridan aquifer have increased levels of fluoride, sodium, gross alpha radiation, heavy metals, sulfate, total dissolved solids, and nutrient compounds in excess of applicable guidance concentrations and/or state and federal drinking water standards. Contaminated ground water, primarily in the surficial aquifer, has migrated off-site under approximately 11 hectures (27.5 acres) of the Cone Ranch property, located south of the CPI facility. 38.39

Quarterly ground-water sampling began at the Central Phosphates facility in April 1985. Based on the results of sampling from these wells in the second quarter of 1985, a warning notice was issued to the facility by the Florida Department of Environmental Regulation (DER) for violation of the primary drinking water regulations. Maximum contamination levels for sodium and chromium were exceeded in a downgradient well in the Floridan aquifer and for sodium, chromium, and fluoride in a down-gradient well in the surficial aquifer.⁴⁰

In June 1987 the West Coast Water Supply Authority provided DER with preliminary data from laboratory analysis' of ground-water samples collected from the Cone Ranch property which indicated degradation of both the surficial and the upper Floridan aquifers.⁴¹

The final report on ground-water investigations conducted at Cone Ranch during May and June 1987, prepared by consultants to the West Coast Regional Water Supply Authority, identifies two areas of contamination on the Cone Ranch property. The report concludes that contamination in one area (designated Area A) was caused by a dike failure and resultant spill of process water from the Central Phosphates facility in 1969 and that contamination in another area (Area B) was caused by seepage of contaminated water from the recirculation pond located immediately north of the spill area.⁴²

A consent order addressing the ground-water contamination problems at the site was drafted by DER during July of 1987 and signed by DER and Central Phosphates, Inc. on September 29, 1987. The consent order documents violations of primary and secondary drinking water standards for chromium, sodium, fluoride, gross alpha radiation, lead, and cadmium from a down-gradient well in the surficial aquifer. These violations occurred from May 6, 1985 through April 27, 1987; maximum values listed in the consent order for each

³⁶ Artisman & Associates, Inc., September 21, 1987, Quality Assurance Project Plan, Central Phosphates, Inc., Plant City Phosphate Complex (part).

³⁷ Castral Phospheres, Inc., March 29, 1989, "National Servey on Solid Wastes from Mineral Procusing Fecilities."

³⁶ West Coast Regional Water Supply Authority. May 11, 1989. Letter from M. G. Korony, Hydrologic Services Manager, to M. Troyer, ICF, Inc.

³⁹ Ardamen & Associates, Inc., August 9, 1988, Consequencies Assessment Report, Control Phosphases, Inc., Plant City Phosphase Complex, Hillaborough County, Floride.

State of Florida, Department of Environmental Regulation, Warning Notice No. 29-85-67-182, July 17, 1985.

⁴¹ Case Chronotogy for Central Phosphetes, Inc., undesed, Florids Department of Environmental Regulation enforcement files.

⁴² Leggette, Brashesra & Grahem, Inc., July 15, 1987, West Coast Regional Water Supply Authority Hydrologic and Water Quality Site Investigation at Coase Ranch, Hillsborough County, Florida.

The north gypsum stack, which first received waste in 1954, occupies approximately 65 hectares (159 acres) at an average height of 9 meters (28 ft). This stack receives process wastewater, phosphogypsum, gypsum solids from "tank clean out," and filter cloths. As of December 31, 1968, the north gypsum stack contained 14 million short tons of material. The south gypsum stack, which first received waste in 1965, occupies approximately 164 hectares at an average height of 14 meters. As of December 31, 1988, the south gypsum stack had accumulated 38 million metric tons of material.

Activities at the Seminole Fertilizer Corporation facility have resulted in elevated levels of several parameters in ground water in the surficial and intermediate aquifers. This contamination has affected potable water wells in the area, some of which have been replaced with water from the City of Bartow's public supply. 50

Seminole maintains eight monitoring wells as part of the ground-water monitoring system required for its state permit. Seminole has stated that MW-3 and MW-7 are up-gradient, background wells. All other wells are listed as down-gradient. The facility's ground-water data from September 1986 through March 1989 show that the down-gradient wells repeatedly exceeded the water quality standards for pH, gross alpha radiation, radium-226 and radium-228, iron, manganese, TDS, sulfate, cadmium, chromium, lead, and fluoride. 51

On March 8, 1988, the Florida DER issued a warning notice to W.R. Grace & Company for violations of its ground-water monitoring permit during the third and fourth quarters of 1987. The standards for gross alpha radiation, radium-226 and radium-228, and sodium had been exceeded in some ground-water samples.⁵² The analytical results showed the following maximum concentrations for each parameter: gross alpha, 107 pCi/L; radium-226 & -228, 14.4 pCi/L; and, sodium, 657 mg/L.

In addition to on-site wells, neighboring potable water wells have also been adversely affected. Analytical data from May 1988 show that 12 of 18 wells contained at least one contaminant at levels above the drinking water standards. Contaminants that were found in the samples included arsenic, lead, sodium, gross alpha, radium-226 and radium-228, iron, pH, sulfate, and total dissolved solids. Potable water wells near the facility were replaced by a public water supply from the City of Bartow, W.R. Grace apparently paid for the water supply line installation and connection to the affected water users. S4

Seminole has also received a warning notice from the Florida DER for an unpermitted discharge of process water from the facility to Bear Branch.⁵⁵

Florida - Other

Management histories similar to those described for the above Florida facilities have also been documented by the Florida DER for CF Chemicals, Inc. and Farmland Industries, Inc. in Bartow, Fl., and for Conserv, Inc. in Nichols, FL.

^{*} Ibid

³⁰ Florida Department of Environmental Regulation. September 29, 1988. Conversation Record between B. Berker, Drinking Water Section, and K. Johnson, FDER.

⁵¹ Seminole Fertiliner Corporation. June 1, 1989. Copy of facility's ground-center moultoring data from 986 to 349.

Floride Department of Environmental Regulation. March 8, 1988. Warning Notice No. 53-68-63-661.

³³ W.R. Grace & Company. June 3, 1988. Letter from Ginea Hall, Environmental Engineer, W.R. Grace & Co., to Kirk Johnson, Florida Department of Environmental Regulation and ground-water mountaring data for private possible wells adjacent to the facility.

³⁴ Florido Department of Environmental Regulation. September 29, 1968. Convenution Record between Bob Barker, Drinking Water Section, and Kirk Johnson, FDER.

Florida Department of Environmental Regulation. May 30, 1984. Warning Notice No. 53-84-05-327.

Recent investigations have focused on leakage from cooling ponds Nos. 1 and 2, which have resulted in ground-water contamination of the first two water-bearing zones at the site. ⁶² In 1988, Texasgulf commissioned a Preliminary Contaminant Assessment for Cooling Ponds 1 and 2 in fulfillment of requirements for the renewal of a zero discharge permit. As part of this study, Texasgulf installed a total of 21 monitoring wells at the site in March and April of 1988. These monitoring wells included 10 wells at Cooling Pond No. 1, nine wells at Cooling Pond No. 2, and two background monitoring wells. ⁶³

Initial ground-water samples, obtained from monitoring wells at each of the cooling ponds during April 1988, show the results for the surficial aquifer and the Croatan Aquifer, which underlies the surficial aquifer at the site.⁶⁴ These results are displayed in Exhibit 12-6.

The first zone appears to be discharging to the facility's main effluent canal, while the direction of ground-water flow in the next zone is toward the northeast and Pamlico Sound. Texasgulf subsequently began additional investigations to delineate the extent of contamination. Initial results appear to support the initial conclusion that contamination is confined to the upper two water-bearing zones and that the Yorktown formation has prevented downward migration of contamination. Texasgulf's Remedial Action Plan is currently under review by the NC-DEM.

Louisiana

Agrico Chemical Co., Donaldsonville, Louisiana

AGRICO Chemical Company's Faustina Works phosphoric acid plant, which is located in Donaldsonville, Louisiana, began operations in 1974. Approximately 68 residents inhabit land within one mile of the facility. Receiving waters are the Mississippi River and the St. James Bayou.

Gypsum waste is slurried with process wastewater to a stacking area, where the solids settle out, and the water drains into adjacent ponds or clearwells.

This facility has experienced problems with elevated concentrations of phosphorus, fluoride and acid pH levels in surface and ground waters. Emergency discharges of untreated waters to surface water have occurred periodically throughout much of the 1980s; contamination of the ground water was reported in 1986.

EPA Region VI has prohibited the discharge of gypsum into the Mississippi River. About 1983, Agrico requested a modification of its NPDES Permit from EPA to allow Agrico to discharge gypsum to the Mississippi River under certain conditions. Agrico argued that the 1973 impoundment design was based on Florida facilities, and that the Louisiana climate and soils are different. Agrico stated that the height

⁴² Texanguif. July 21, 1988. Preliminary Contamination Assument at Cooling Funds No. 1 and 2, Texanguif Inc. Phosphate Operations, Aurora, North Carolina.

⁰ Did

⁶⁴ Temograf. July 21, 1988. Prolineary Contemination Assessment at Cooling Ponds No. 1 and 2, Temograf Inc. Phosphase Operations, Aurora, North Carolina.

⁴⁵ NC-DEM. December 13, 1988. Memorandum from B. Reid to A. Mouberty, Re: Temagelf, Inc. Renoval of Permit No. 2982, Cooling Fonds Nos. 1 and 2.

⁶⁶ NC-DEM. January 17, 1989. Memorandum from R. Jones to C. McCaskill, Sup. State Engineering Review Unit, Permits and Engineering Branch, Re: Permit Renoval No. 2982 Cooling Frank #1 and #2 Temagnill, Inc.

⁴⁷ NC-DEM. December 13, 1988. Memorandum from B. Raid to A. Mouberry, Re: Tempelf, Inc. Reserval of Permit No. 2982, Cooling Fonds Nos. 1 and 2.

M NC-DEM. June 3, 1989. Memorandum from B. Reid to R. Smithwick, Re: Texasgulf, Inc. Remedial Action Plan Cooling Ponds No. 1 and No. 2.

Articinen & Associates. February 6, 1990. Letter from T.S. Ingra and J.E. Gerlanger to W.A. Schimming, Tettingulf, Re: Response to Deficiencies Noted by DEM Concerning the Cooling Pond No. 1 and No. 2 Remedial Action Plan and Proposed Revised Remedial Action Plan, Tempelif Phosphote Operations.

spilled water was pumped to another gypsum holding stack; concern over the potential failure of this stack. however, led Agrico to discharge the untreated water to the Mississippi River over a period of several weeks. These discharges exceeded permit limits. 75,76 After the pond failure, water of pH 2 was found flowing in an on-site drainage ditch at approximately 20 gpm into the St. James Bayou. The large volume of released water had destroyed a dam that controlled flow from the drainage ditch into the St. James Canal. Agrico reinstalled the dam on April 22, 1983, and transferred the low pH water still in the dammed section of the ditch back to the gypsum pond system. Agrico checked the water in St. James Canal, concluding that it did not seem affected by the low pH water discharged to it as a consequence of the April 15, 1983 gypsum pond failure. 77,78

Due to heavy rainfall, Agrico has continued to periodically perform emergency discharges of untreated stormwater from the clearwell, as occurred in March and again in June 1987. In its letter of notification, Agrico stated that "additional rain could result in catastrophic levee failure leading to loss of life, personal injury, or severe property damage. 79

In March 1986, Agrico reported to LA DEQ that the water along the length of the north and east phosphogypsum perimeter ditches might be "slightly impacted" by phosphate, sulfate, and fluoride. 80

In August 1986, Agrico submitted to LA DEQ a Hydrologic Assessment report for the Donaldsonville facility. LA DEQ regarded the reported situation as requiring corrective action: "Contamination of the shallow ground water, although by constituents which are not of great concern, poses a threat to drinking water. The Department's position is that the same physical characteristics that allow the contaminants to travel through the shallow silt faster than your theoretical model are present in the underlying clays. 451

Even under non-emergency circumstances, Agrico has had difficulty keeping in compliance with NPDES permit limitations. In April 1987, an investigator reported that discharges from Agrico's inactive gypsum impoundment (Outfall 002) were in exceedance (up to 35 times) of permitted levels. However, the investigator determined that no action would be taken "until reissuance of new permit."

In August 1987, LA DEQ determined that Agrico could not comply with the Louisiana Water Discharge Permit System that had been effective since March 1987. LA DEQ issued an Administrative Order to Agrico to allow the facility to temporarily discharge water from gypsum stacks until standards were mel 84,85,86,87

 ⁽_continued)
 U.S. Environmental Protection Agency, Region 6. Undeted. Report submitted by attorneys for Agrico Chemical Company,
 U.S. Environmental Protection Agency, Region 6. Undeted. Report submitted by attorneys for Agrico Chemical Company,
 U.S. Environmental Protection Agency, Region 6. Undeted. Report submitted by attorneys for Agrico Chemical Company,
 U.S. Environmental Protection Agency, Region 6. Undeted. Report submitted by attorneys for Agrico Chemical Company, Kesn, Miller, Hawthorne, D'Armond, McCowen & Jarmen, and Hall, Estill, Hardwick, Gebie, Collingsworth & Nelson, Re: Agrico Chemical Company, NPDES Permit LA0029769.

⁷⁵ Ibid-

N Louisiesa DEQ. October 25, 1984. Memorandum trom Patricia L. Norton, Secretary, to J. Dele Givens, Assistant Secretary, Re: Agrico Chemical Co.

Agrico. Agril 29, 1963. Letter from R.A. Woolesy, Plant Manager to J. Dale Givens, Administrator DNR, Rev. WPCD. Inspection of the Feurine Facility on April 22, 1983.

Louisiana DNR. May 11, 1963. Installation Inspection Forms, completed by Sunna Sumari, Installation Representative.

Agrico. Jese 17, 1987. Letter from R.A. Woolsey, Plant Manager to Myros O. Kaudson, U.S. EPA Region 6 Director Water Management, Re: NPDES Permit Number: LASS29769. With attachment.

Agrico. March 12, 1986. Letter from Sume P. Stewart, Manager, Energy and Environmental Control to Gerald Healy. Administrator, LA DEQ Solid Wasse Division, Re: Agrico Phosphogypuus Site (P-0063) GD-073-0791.

¹⁷ Louisiana DEQ. August 22, 1984. Latter from George H. Cramer, II, Administrator to Scene Stowers, Agrico Manager Energy and Environmental Control, Re: Hydrogeologic Assessment, Final Report GD-093-4791.

U.S. Environmental Protection Agency, Region 6. 1986-88. MPDES Violation Summeries, from 10/18/86 - 4/12/88.

⁵ Louisiana DEQ. August 17, 1987. Inter-office Letter, from Q.S. Chembers to D.J. Miller, Re: Feestina Plant - Administrative Order.

M Ibid

to the emergency bypass of the clearwell water. The accumulation of facts throughout the documents suggests that excess water can cause failure of the gypsum stack or of the clearwell walls. During a discharge on February 27, 1987, Arcadian stated that the action was necessary to prevent possible injury and severe property damage. Such a discharge occurred again beginning on March 10 of the same year. During these discharges, pH values ranged from 1.3 to 2.5; phosphorus concentrations from 3,688 mg/L to 7,960 mg/L and fluorine concentrations from 6,188 to 14,649 mg/L.

An EPA NPDES Violation Summary, based on discharge monitoring reports from March 1986 to December 1987, showed that Outfall 003 violated effluent limits each month from at least December 1985 until August 1987. No enforcement action was taken for any of these violations. Since February of 1987, the EPA inspector has noted: "No action taken - waiting for an enforceable permit." Contaminant concentrations were similar to those listed above.

On December 8, 1988, EPA Region VI issued an Administrative Order to Arcadian regarding several violations, including the discharge on October 28 of that year of calcium sulfate run-off (Outfall 003) containing total phosphorus of 8,176 lbs/day, exceeding the permitted limit of 7,685 lbs/day.⁹⁷

According to the LA DEQ, this facility has not experienced non-compliance or emergency bypass problems since those outlined in this section.

Louisiana - Other

The management histories described for the above Louisiana facilities are also typical of the other Agrico facilities (Hahnville and Uncle Sam).

12.3.3 Findings Concerning the Hazards of Phosphogypsum and Process Wastewater

Based upon the detailed examination of the inherent characteristics of phosphogypsum and process wastewater arising from the production of wet process phosphoric acid, the management practices that are applied to these wastes, the environmental settings in which the generators of the materials are situated, and the numerous instances of documented environmental damage that have been described above, EPA concludes that current practices are inadequate to protect human health and the environment from the potential danger posed by these wastes.

Intrinsic Hazard of the Wastes

Review of the available data on phosphogypsum and its leachate constituent concentrations indicates that concentrations of 12 constituents exceed one or more of the screening criteria by more than a factor of 10, and that maximum chromium and phosphorus concentrations exceed the screening criteria by factors of greater than 1.000. In addition, two samples of phosphogypsum (out of 28) contained chromium concentrations in excess of the EP toxicity regulatory level, and phosphogypsum frequently contains aranium-238 and its decay products at levels that could present a high radiation hazard if the waste is allowed to be used in an

M Kenn, et al, Attornoya et Law. November 6, 1984. Letter from M.N. Harbourt to J.V. Ferguson, EPA Region 6, Re: Notice of Assistanced Bypans, NFDES Fermit No. LA6064257, Arcadian Corp., EPA File No. 7945-1.

Arcadisa. February 27, 1967. Latter from M.N. Harbourt to J. Van Buskirk, EPA Region 6 and J.D. Givens, LADEQ, Re. Notice of Assistanted Bypans and Request for Order Authorizing Bypans.

⁵⁶ Kenn, et al. Attorneya at Lew. March 19, 1987. Letter from M.N. Harbourt to J. Von Buskirk, EPA Region 6, Re: Arcadian Corporation - NPDES Permit Number: LA-4066257, EPA Pile Number: 7945-1.

⁹⁷ U.S. Environmental Protection Agency, Region 6. December 8, 1988. Cover letter from M.O. Kaudson to H.J. Baker. Arcadian, Re: Administrative Order Docket No. VI-89-043, NPDES Permit No. LA0066257. 128/88. (Administrative Order attached).

disposed in stacks or in mined-out areas, effectively prohibiting use as a construction material or agricultural soil supplement. 98

Under the Clean Water Act, EPA has the responsibility for setting 'effluent limitations,' based on the performance capability of treatment technologies. These 'technology based limitations,' which provide the basis for the minimum requirements of NPDES permits, must be established for various classes of industrial discharges, including a number of mineral processing categories.

Permits for mineral processing facilities may require compliance with effluent guidelines based on best practicable control technology currently available (BPT) or best available technology economically achievable (BAT). BPT effluent limitations of process wastewater from wet-process phosphoric acid, normal superphosphoric acid, and triple superphosphoric acid include (40 CFR 418.12(c)):

Pollutant	Daily Maximum	Monthly Average
Total Phosphorus	105 mg/L	35 mg/L
Fluoride	75 mg/L	25 mg/L
Total Suspended Solids	150 mg/L	50 mg/L

Effluent limitations concerning the concentrations of pollutants contained in (1) the discharge of contaminated non-process wastewater after application of BPT and BAT (40 CFR 418.12(d) and 418.13(d)), (2) discharges of process wastewater related to phosphoric acid production from existing sources after application of BAT (40 CFR 418.13(c)), and (3) process wastewater from defluorination of phosphoric acid after application of BPT and BAT are identical and as follows (40 CFR 422.52(c) and 422.53(c):

Pollutarit	Daily Madmum	Monthly Average
Total Phosphorus	106 mg/L	35 mg/L
Fluoride	75 mg/L	25 mg/L

No discharges of process wastewaters from the production of phosphoric acid or from the defluorination of phosphoric acid are allowed from new sources.

In cases where the State does not have an approved NPDES program, such as Texas, Louisiana, and Florida, EPA Regional personnel have stated that EPA applies the above guidelines. However, EPA may also adopt State water quality standards for the management of these discharges, if applicable. In Idaho, which also does not have an approved NPDES program, the Federal guidelines listed above would apply. EPA Regional staff have not been available to confirm current policy regarding discharges from phosphoric acid facilities. The State of Florida does not currently have an EPA-approved NPDES program. Therefore, existing Federal regulations concurring the management of wastes from the production of phosphoric acid, would apply for facilities in this State. Wastes from phosphoric acid production are subject to the effluent limitation guidelines set forth in 40 CFR Part 418 Subpart A.

The Chevron Chemical Company phosphoric acid facility located in Rock Springs, Wyoming is situated on federal lands managed by the Bureau of Land Management (BLM). The Federal Land Policy and Management Act of 1976 (FLPMA, 43 USC 1732, 1733, and 1782) authorizes BLM to regulate mining

⁵⁸On April 10, 1990 EPA published a Notice of Limited Reconsideration that provided a limited class waiver that allows continued use of phosphogypsum for agricultural uses for the duration of the current growing season, but not to extend beyond October 1, 1990. This notice also solicited comment on alternative uses of phosphogypsum, i.e., management practions other than disposal.

The limitations for defluorization process westerwater also include daily maximum limits of 150 mg/L and 6-9 and monthly average limits of 50 mg/L and 6-9 for TSS and pH respectively.

12.5 Waste Management Alternatives and Potential Utilization

12.5.1 Waste Management Alternatives

Waste management alternatives, as discussed below, include alternative processes for manufacturing phosphoric acid and methods of purifying (i.e., reducing concentrations of radionuclides and/or other contaminants) the phosphogypsum so that it can be safely used in agriculture or construction. Direct recycling of phosphogypsum is not a viable alternative, because the phosphogypsum itself cannot be used in the production of phosphoric acid, although it is already common practice to recycle the process water used to slurry the phosphogypsum. One exception to this, as is discussed briefly in the section on utilization, is the production of sulfur dioxide (SO₂) by the thermal decomposition of phosphogypsum, which can be recycled to the manufacturing process as sulfuric acid.

Process Alternatives for Manufacturing Phosphoric Acid

These alternative processes are considered in this section because the phosphogypsum that they generate may differ in its degree of hydration (hemihydrate vs. dihydrate) at the time of generation, which can determine which purification methods can be applied to the phosphogypsum, and how efficiently they can remove the impurities. In addition, the amount of preprocessing required before some types of utilization (e.g., as wall board or plaster) can also vary with the production process used. Unfortunately, there is insufficient data available to attempt an evaluation the volume, composition, or potential hazard(s) of the phosphogypsum generated by the different processes. Consequently, this discussion focuses on the differences that could be relevant to the subsequent treatment, utilization, or disposal of phosphogypsum generated by the different processes.

Description

The processes to be discussed are the classic Prayon and Nissan-H processes which generate the dihydrate form of phosphogypsum (CaSO₄· $2H_2O$); and the Central-Prayon and Nissan-C processes, which generate the hemihydrate form of phosphogypsum (CaSO₄· $4H_2O$).

In the classic Prayon process, the dihydrate phosphogypsum is filtered out of the solution produced by the digestion of phosphate rock by sulfuric acid. The phosphogypsum is then pumped as a slurry to gypsum stacks for disposal. 100,101

In the Central-Prayon process, the dihydrate phosphogypsum is filtered out of the solution produced by the digestion of phosphate rock by sulfuric acid. The phosphogypsum is converted to the hemihydrate form by heating it and adding sulfuric acid, whereupon the hemihydrate/phosphogypsum is extracted from the acid slurry by counter-current washing, and the liquid is recycled to the phosphate rock digestion process, and the hemihydrate slurry being sent to the stacks for disposal. 182

In the Nissan-H process, the phosphete rock is digested by sulfuric acid at a high temperature which causes most of the phosphate rock to decompose and the hemilydrate form of phosphogypsum to be generat-

Pena, N., <u>Utilization of the Photohoroscum Produced in the Partition Industry,</u> UNIDO/18.533, United Nations Industrial Development Organization (UNIDO), May 1965, p. 30.

Muchiberg, P.E., J.T. Reding, B.P. Shephard, Terry Pursons and Glynds E. Wildes, <u>Industrial Process Profiles for Environmental User</u>. Chapter 22. The Phosphate Rock and Basic Fertilizer Materials Industry, SPA-4602-77-423v, Environmental Protection Technology Series, prepared for Industrial Environmental Research Laboratory, ORD, U.S. Environmental Protection Agency, February 1977, p. 21.

¹⁰² Did., p. 31.

ed. 103 The hemihydrate slurry is cooled and recrystallized to dihydrate by using seed crystals of dihydrate phosphogypsum. This recrystallization step results in the formation of phosphogypsum crystals which can be easily filtered, and are believed to be of sufficient quality to be utilized in building materials without additional treatment. 104,105

The Nissan-C process is very similar to the Nissan-H process, the main difference being that the hemihydrate slurry is recrystallized by both cooling it and changing its acid concentration, which results in phosphoric acid concentrations of 45-50 percent without evaporation (as opposed to the 30-35 percent normally produced by the dihydrate processes) and in a higher quality phosphogypsum.¹⁰⁶

Current and Potential Use

It is uncertain which of the above processes are used by each of the phosphoric acid facilities, although EPA believes that at least two or three of the facilities use one of the processes (Central-Prayon or Nissan-C) which generate hemihydrate phosphogypsum, and that the rest of the facilities use one of the processes (classic Prayon or Nissan-H) which generate dihydrate phosphogypsum.

There do not appear to be any insurmountable obstacles preventing any of the facilities from using any of the available production processes. Some of the reasons why particular facilities use, or have converted to, a particular process have been that the hemihydrate processes are more energy efficient because the phosphoric acid that they produce is more concentrated (hence, requires less evaporative concentration, which is energy-intensive), and that the dihydrate processes are easier to control and maintain. If it becomes necessary to reduce the radionuclide content in the phosphogypsum (see the discussion of phosphogypsum purification below) so that it could be utilized rather than disposed (see section 12.5.2), facilities might have more incentive to begin using one of the processes which generate hemihydrate phosphogypsum, since the two purification methods which employ acid digestion require anhydrite or hemihydrate phosphogypsum.

Purification of Phosphogypsum

Utilization of phosphogypsum in construction and agriculture is constrained by the presence of impurities and hazardous constituents in the waste. Constituents such as radium-226 and arsenic may need to be removed because of the hazards they may present to human health and the environment, while phosphates and fluorides need to be removed for technical reasons related to the methods of utilization. The impurities include insolubles such as silica sand and unreacted phosphate ore; occluded water soluble phosphoric acid and complex fluoride salts; and interstitially trapped ions within the phosphogypsum crystal lattice, such as HPO_a², AIF_a², and radioactive radium-226.¹⁰⁷

Description

Several processes for removing radium-226, as well as the other impurities, have recently been developed. These processes involve either acid digestion of the phosphogypsum or simple physical removal of the more radioactive portions of the phosphogypsum.

¹⁰⁰ Did. p. 14.

¹⁰ Did. p. 16.

The absence of supporting data has provided EPA from evaluating the validity of this statement.

Muchiberg, op. cl., p. 18.

Paimer, J.W., and J.C. Guysor, Phosphorypsum Purification, USO Corporation, Libertyville, Blinois, May 30, 1985, p. 1.

ma loid

¹⁰⁰ Palmer, J.W., <u>Process for Reducine Redicactive Contemination in Photobogroups</u>, U.S. Patent 4,338,292 to USG Corporation, June 14, 1983, p. 2.

Ra-226 Concentrations in Phosphogypsum, Listed by State Effect of Purification Methods on Exhibit 12-7,

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a of Relative Hazaria of Cheseriate Freducts and Wester, proposed for the U.S. Department of Energy, DOE Contract No. DE AC07.76(D01570, I

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of physical separation should be able to reduce the radium-226 concentration below the 10 pCl/g threshold in most of the phosphogypsum generated.

Therefore, it appears that only a small portion of phosphogypsum produced annually could be sufficiently purified by the physical separation technique. In order to reduce all the phosphogypsum to a level at or below the 10 pCi/g threshold, the purification methods using acid digestion would be required.

Factors Affecting Regulatory Status

The residuals generated by the acid digestion purification of phosphogypsum have a specific activity of up to 600 pCi/g¹¹¹, and while the purification process generates a relatively low volume of waste, it is very concentrated and may pose disposal problems that equal or outweigh those associated with the original phosphogypsum. At this time, however, EPA does not have sufficient information to articulate a position on the regulatory status of this residue. One waste management strategy which has been suggested for immobilizing the radionuclides is to blend it with waste phosphatic clay suspensions (slimes) and allow the mixture to solidify. The discussion in Section 12.5.2 on utilization of phosphogypsum in mine reclamation provides an explanation of this approach.

While no information was found on the volume or radium-226 concentration of the waste resulting from the physical separation method, it too would produce residuals with relatively high concentrations of radium-226.

12.5.2 Utilization

Described below are a number of alternatives for utilizing phosphogypsum. Some of these uses, such as agriculture and mine reclamation, already utilize significant amounts of phosphogypsum. Other alternatives (e.g., use as a construction material) have been shown to be technically feasible, but for a variety of reasons have not moved beyond the developmental stage of field testing in the U.S.

At the time of this assessment, it is uncertain which, if any, of the uses discussed below will be allowed. EPA currently requires that phosphogypsum be disposed in stacks or mines, which precludes alternative uses of the material, 113 except for a limited class waiver for the agricultural use of phosphogypsum, which will be in effect until October 1, 1990. EPA has, however, announced a limited reconsideration of the rule requiring the disposal of phosphogypsum in stacks or mines, and has also given notice of a "proposed rulemaking by which EPA is proposing to maintain or modify the rule to, alternatively or in combination, (1) make no change to 40 CFR Part 61, subpart R, as promulgated on October 31, 1989, (2) establish a threshold level of radium-226 which would further define the term "phosphogypsum", (3) allow, with prior EPA approval, the use of discrete quantities of phosphogypsum for researching and developing processes to remove radium-226 from phosphogypsum to the extent such use is at least as protective of public health as is disposal of phosphogypsum to the extent such use is at least as protective of public health as is disposal of phosphogypsum to the extent such use is at least as protective of public health as is disposal of phosphogypsum in mines or stacks. 114

¹¹¹ Moisset, J., <u>Location of Radium in Phosphorypsum and Improved Procus for Removal of Radium from Phosphorypsum</u>, Platrus Lafarys (France) (date not known).

Painer, J.W. and J.C. Geynor, Method for Solidifying Waste Sline Suspensions, U.S. Patent 4,457,781 to USG Corporation, July 3, 1984, p. 4.

^{113 54} FR 51654, December 15, 1989.

^{114 55 &}lt;u>FR</u> 13462, April 10, 1990.

In a different study, data on the radium-226 content of phosphogypsum samples from Florida and Idaho were used to calculate the increase in radium-226 content of soil to which phosphogypsum is applied. The study found that the application of 1 metric tons of 40 pCi/g phosphogypsum to 1 hectare of land, and mixed in the soil to a depth of 20 cm, would increase the radium-226 content of the soil by 0.01538 pCi/g. Therefore, the application of phosphogypsum for the purpose of sulfur fertilization (assuming an application rate of 0.1 metric tons per hectare per year) would result in an increase in the soil's radium-226 content of 0.0015 pCi/g-year, while the application of phosphogypsum for the purpose of sediment control (assuming an application rate of 4.0 metric tons per hectare per year) would result in an increase in the soil's radium-226 content of 0.62 pCi/g-year. Over a period of 100 years, these application rates would cause radium-226 concentrations to increase by 0.15 and 6.2 pCi/g, respectively, as compared to the typical radium-226 content in soils of 1-2 pCi/g.¹¹⁷

Feesibility

It is uncertain whether future regulations will completely preclude the agricultural uses of phosphogypsum, or only limit when and how it may be used. Since many farmers have continued to use phosphogypsum despite the prospect of new regulatory prohibitions, and concerns about the radium-226 found in phosphogypsum, it is not unreasonable to assume that farmers would continue to use it in the future, if it remains economically competitive. However, if it becomes necessary to reduce the radium-226 content before it can be used, the additional costs are likely to reduce the amount of phosphogypsum used if purification would make phosphogypsum more expensive than the materials it competes with.

Utilization of Phosphogypsum for Mine Reclamation

Description

An alternative to the direct disposal of phosphogypsum in stacks and/or mines has been developed in which phosphogypsum is mixed with phosphatic clay suspension (a waste stream from the beneficiation of phosphate rock), and placed in a disposal site (generally the phosphate mine) where it consolidates and can be reclaimed by planting grass and trees. The process begins by increasing the solids content of the phosphatic clay suspension to 10 percent; a portion of the dewatered clay is pumped to the phosphoric acid plant and mixed with phosphogypsum from the belt-filters; the clay-phosphogypsum mixture (blend) is put into a blend tank and additional phosphogypsum from the stacks and phosphatic clay suspension are added until there are approximately 3 parts phosphogypsum to 1 part clay; the resulting blend (35 percent solids) is pumped as a slurry to the disposal site; and after the blend has had approximately one year to dewater and consolidate, it is possible to plant grass and trees on the surface.

¹¹⁷ Bursu, R.G., Aericeltural Innect of Radium-226 in Grossen Derived from Phonohese Fertiliter Measurecture, October 1976.

^{136 55} FR 13462 April 10, 1990.

¹¹⁹ Personal communication, Dr. Gery Gencho, University of Georgia Experiment Station, April 25, 1990.

Palmer, Jay W. and A.P. Kouloberis, Simes Wasse Solidification with Hydracubic Calcium Sulfan, paper to be presented at the University of Mismi Civil Engineering Department Seminar on Phosphogypeum on April 25-27, 1984, p. 279.

¹²¹ Personal communication, William A. Schimming, Environmental Affairs Manager, Tetragulf Inc., April 30, 1990.

Feesibility

It is likely that this management alternative will have a greater level of social acceptability than current practices, which result in large, barren disposal areas. EPA does not believe that the rule requiring that phosphogypsum be disposed in stacks or mines (thereby precluding alternative uses of the material) will preclude the use of this alternative, since it does not involve putting the phosphogypsum-clay blend anywhere except in stacks and mines. The greatest barriers to the use of this alternative appear to be geographic and technical in nature (see the discussion on Current and Potential Use), although there may also be some economic barriers (e.g., turrent practices are less expensive).

Utilization of Phosphogypsum in Construction Materials

Phosphogypsum can be utilized as a construction material in a variety of ways. The two major areas of use are in building materials and highway construction. This section describes and evaluates applications in both areas.

Description

Phosphogypsum has the same basic properties as natural gypsum and may be used as a substitute for natural gypsum in the manufacture of commercial construction products. Approximately 70 percent of the natural gypsum used in the U.S. is for the manufacture of gypsum board or partition panels. Another 19 percent is used as an additive to cement. Addition of natural gypsum to cement retards the setting time, counteracts shrinkage, speeds the development of initial strength, and increases long-term strength and resistance to sulfate etching. The remaining 11 percent of all natural gypsum use is attributable to agricultural uses (7 percent) and miscellaneous uses including the manufacture of plaster and cement. 131 Phosphogypsum generated from the classic Prayon process for phosphoric acid production must be purified by removing phosphates, fluorides, and other impurities for it to be successfully used in the production of building materials or as an additive to cement, whereas phosphogypsum from the Central-Prayon, Nissan-H. and Nissan-C processes may often be used directly as natural gypsum substitutes without the need for purification.

Phosphogypsum from all four processes may often be used in the manufacture of cement without additional purification. One of the most promising processes for utilizing phosphogypsum in the manufacture of portland cement is the OSW-Krupp process, a modification of the Müeiler-Kühne process. In this process, phosphogypsum is dried in a rotary dryer and mixed with coke, sand, and clay. The mixture is then ground, pelletized, and fed to a rotary kila where SO₂ and clinker are formed. The SO₂ can then be passed to an acid conversion plant to produce H₂SO₄, which may be recycled to the phosphoric acid production process. The clinker is cooled and metered along with natural gypsum onto a belt conveyor feeding into a finished cement mill. 132

Phosphogypsum generated from all phosphoric acid production processes may be used successfully as a road base, when stabilized with 5-10 percent portland cement or 15-25 percent fly ash, mixed with granular soil and compacted for secondary road construction, used in a portland cement concrete mixture and compacted to form roller-compacted concrete for paving driveways and parking areas, or used as fill and subbase material. 133,134

^{130 54} FR 51654 December 15, 1989.

¹³¹ Chang, W.F. and Murray I. Mantell, <u>Engineering Properties and Construction Applications of Phosphorypum</u>, Phosphate Research Institute, University of Minni Press, Coral Gables, Florida, 1990, p. 4.

Zellers-Williams Company, A.P. Kouloberis, principal investigator, <u>Evaluation of Potential Commercial Procuses for the Production of Sulfure Acid From Photohogynum</u>, Publication No. 01-002-001, Florida Institute of Photohogynum, Cotober 1981, pp. 18, 22.

¹⁰¹ Ibid., pp. 177-189.

above. As is discussed at the beginning of this section, EPA is currently considering a number of regulatory options, two of which could conceivably allow phosphogypsum to be utilized in construction.

If a threshold level of radium-226 is established (regulatory option (2)), it may be possible to utilize the phosphogypsum after purification (i.e., reducing the radium-226 content) (see section 12.5.1). Assuming that the proposed threshold level of 10 pCi/g were adopted, and the physical separation method described in section 12.5.1 were used to purify the phosphogypsum, the data displayed in Exhibits 12-7 and 12-8 suggest that some of the phosphogypsum generated in the states of Florida, Idaho, Louisiana, Mississippi, North Carolina, and Texas might have a radium-226 content lower than the threshold value of 10 pCi/g. However, the available data are not detailed enough for EPA to estimate how much of the purified phosphogypsum would contain less radium-226 than the threshold level, or if phosphogypsum with a sufficiently low radium-226 concentration would be close enough to the potential markets for it to be economically competitive. Similarly, if one of the acid digestion purification methods (see section 12.5.1) were used to purify the phosphogypsum, the data in Exhibits 12-7 and 12-8 suggest that all of the phosphogypsum generated in the U.S. would have radium-226 concentrations lower than the threshold level.

It is not clear whether adoption of the fourth regulatory option would preclude the use of phosphogypsum in construction materials. It is likely that the determination of whether a particular use of phosphogypsum is at least as protective of human health and the environment as phosphogypsum disposal in stacks or mines, would have to be made on a case by case basis.

Fessibility

Even if it is allowed by the regulations, it is uncertain whether a significant amount of phosphogypsum would be utilized as a construction material. The basis for this conclusion is that even before the current constraints on the utilization of phosphogypsum were imposed, very little phosphogypsum has been used in construction; consumer concern over indoor radon is likely to discourage the use of products made from phosphogypsum, which may be perceived as a significant source of radon even if purified; natural gypsum is readily available in most parts of the U.S.; and there is concern about the exposure (e.g., via leaching and subsequent ingestion, see section 12.3.1) of humans to the hazardous constituents in phosphogypsum.

12.6 Cost and Economic Impacts

Section 8002(p) of RCRA directs EPA to examine the costs of alternative practices for the management of the special wastes considered in this report. EPA has responded to this requirement by evaluating the operational changes that would be implied by compliance with three different regulatory scenarios, as described in Chapter 2. In reviewing and evaluating the Agency's estimates of the cost and economic impacts associated with these changes, it is important to remember what the regulatory scenarios imply, and what assumptions have been made in conducting the analysis.

The focus of the Subtitle C compliance scenario is on the costs of constructing and operating hazardous waste land disposal units. Other important aspects of the Subtitle C system (e.g., corrective action) have not been explicitly factored into the cost analysis. Therefore, differences between the costs estimated for Subtitle C compliance and those under other scenarios (particularly Subtitle C-Minus) are less than they might be under an alternative set of conditions (e.g., if most affected facilities were not already subject to Subtitle C). The Subtitle C-Minus scenario represents, as discussed above in Chapter 2, the minimum requirements that would apply to any of the special wastes that are ultimately regulated as hazardous wastes; this scenario does not reflect any actual determinations or preliminary judgments concerning the specific requirements that would apply to any such wastes. Further, the Subtitle D-Plus scenario represents one of many possible approaches to a Subtitle D program for mineral processing special wastes, and has been included in this report only for illustrative purposes. The cost estimates provided below for the three scenarios considered in this report must be interpreted accordingly.

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hazardous process water is assumed to be used to transport the phosphogypsum to the management unit. Because phosphoric acid production process wastewater is a dilute, aqueous liquid, that is usually corrosive and often EP toxic, the management practice of choice under Subtitle C is treatment (neutralization and/or metals precipitation). The scenario examined here involves construction of a Subtitle C surge pond (double-lined surface impoundment) which feeds a system of concrete impoundments in which treatment is performed. Following treatment, the effluent may be reused by the facility (e.g., to slurry fluorogypsum to the gypsum stack or impoundment) just as it is under current practice. The sludge is assumed to be non-hazardous and is assumed to be disposed of in an unlined disposal impoundment or landfill.

Subtitle C-Minus

Assumed practices under Subtitle C-Minus are identical to those described above for the full Subtitle C scenario, with the exception that some of the requirements for construction and operation of the hazardous waste surge pond have been relaxed, most notably the liner design requirements.

Subtitle D-Plus

Assumed practices under Subtitle D-Plus are identical to those described above for the Subtitle C-Minus scenario. Generators of process wastewaters are assumed to pose either moderate or high risk to ground water, even if, as is true in one case in the phosphoric acid sector, the environmental conditions indicate a low risk. Therefore, all facilities meet the same requirements under both Subtitle D-Plus and under Subtitle C-Minus; ground-water monitoring, a practice that is not required under the low risk Subtitle D-plus scenario, is assumed to be required in all cases.

Phosphogypsum

Subtitle C

Under Subtitle C standards, of hazardous waste that is managed on-site must meet the standards codified at 40 CFR Parts 264 and 265 for hazardous waste treatment, storage, and disposal facilities. The Agency has assumed that the phosphogypsum can and will be managed separately from the other special waste, process wastewater; non-hazardous process wastewater is assumed to be used to transport the phosphogypsum to the management unit. Because phosphogypsum is an inorganic solid that is transported in slurry form, the management practice of choice under Subtitle C is surface impoundment disposal. EPA has determined that because of Subtitle C closure requirements, existing waste management units (gypsum stacks) would not be permissible, because of the steep (nearly vertical) angles with which they are constructed. Closure of such units would require extensive contouring and regrading (so that they could be capped effectively), such that the total area occupied by the unit at closure would greatly exceed the space occupied during its operating life. The scenario examined here involves construction of a double-lined Subtitle C surface impoundment of significant size. The gypsum would be sturried to this impoundment in much the same way as it is currently slurried to gypsum stacks. Following settling of the suspended phosphogypsum, the transport water would be removed and piped back to the process operation for reuse, just as it is under current practice.

Subtitle C-Minus

Two primary differences are assumed to exist between full Subtitle C and Subtitle C-minus. The first is the assumption that facilities could use gypsum stacks if their use is less costly than using disposal impoundments. The second difference is the facility-specific application of tailored requirements based on potential risk to groundwater at affected facilities. Under the C-Minus scenario, as well as the Subtitle D-Plus scenario described below, the degree of potential risk of contaminating ground-water resources was used as a decision criterion in determining what level of protection (e.g., liner and closure cap requirements) would be necessary to protect human health and the environment. Ten of the 11 facilities assumed to generate

Exhibit 12-9
Compliance Cost Analysis Results for Management of Process Wastewater from Phosphoric Acid Production^(a)

	Baseline Waste	Incremental Cools of Regulatory Compilence										
	Management Cost		Subtitio C		94	delilo C-Min	w	. 8	ubililo D Pk			
Facility	Annual Total (8 dos)	Annual Total (0 000)	Total Capital (8 000)	Annual Capital (8 800)	Annual Total (6 000)	Total Capital (6 000)	Annual Capital (\$ 000)	Annual Total (8 000)	Yotal Capital (\$ 800)	Annua Capital (\$ 000)		
						•						
Agri Chem - Baston, FL	296	5,840	15,400	2,311	5,537	13,781	2,056	5,434	13.781	2.056		
Agrico Chemical - Denaldromillo, LA	267	12,131	39,213	5,051	11,677	36,708	5,477	11,677	36,706	5.47		
Agrico Chemical - Mulberry, FL	200	11,000	32,230	4,011	10,654	29,795	4,446	10,551	29,795	4.44		
Agrico Chamical - Unate Som, LA	314	16,541	50,321	7,500	14,975	47,193	7,042	14,872	47,193	7.04		
Areadon - Gelemer LA	247	8,376	16,100	2,414	5,162	15,022	2,241	5,059	15,022	2,24		
Control Phosphaton - Plant City, FL	220	22,313	66,915	10,263	21,000	62,050	9,260	21,000	62,058	9.26		
CF Chemicals - Barton, FL	. 606	6,950	19,436	2,000	6,610	17,578	2,623	6,507	17,578	2.62		
Charton - Rock Springs, WY	201	4,700	12,430	1,050	4,504	11,043	1,640	4,402	11.043	1.64		
Concerv - Mahala, FL	261	3,213	8,004	1,194	3,048	7,110	1,061	2,946	7.110	1.06		
Formland Industries - Barton, FL	205 .	0,817	18,332	2,736	6,465	16,300	2,447	6,362	16,399	2,44		
Gardinier - Phrenders, FL	636	16,544	51,094°	7,624	15,633	46,047	6,871	15.530	46.047	6,07		
IMC Fortilleer - Mulberry, FL	326	20,300	79,067	11,798	25,619	75,236	11,226	25,516	75,236	11.22		
Mobil Mining - Pasadona, TX	276	6,023	24,170	3,600	7,630	22,000	3,293	7.535	22,068	3.29		
Nu-Bouth Industries - Passagoula, MB	810	7,071	26,001	3,003	7,401	24,013	3,563	7,300	24,013	3,58		
No Wool - Bada Springs, ID	200	6,743	18,424	2,451	5,464	14,000	2,223	5,361	14.099	2,22		
Occidental Chemical - White Springs, FL	624	12,700	36,856	5,490	12,256	33,912	5,060	12,153	33,912	5.06		
Reyeler - Mulberry, FL	824	6,506	17,902	2,671	6,192	16,183	2,415	6,069	16,163	2.41		
Royeler - Palmette, FL	540	10,710	36,137	5,302	10,187	33,262	4,963	10,094	33,262	4.96		
Seminolo Fertilizer - Bartow, FL	620	12,946	37,106	5,549	12,434	34,356	5,126	12,331	34,356	5,12		
JR Simplet - Pocatello, ID	686	5,300	14,950	2,232	5,003	13,452	2,007	4,990	13,452	2.00		
Tempeguil - Ausera, MC	300	10,106	62,100	9,276	17,363	87,893	8,638	17,290	57,093	0.63		
Total:	8,897	225,000	662,629	101.057	215,121	629.007	93,706	213,167	628 007	93,70		
Average:	424	10,716	35,506	4,850	10,244	29,905	4.462	10,151	29,905	93,70		

⁽a) Values reported in this table are those computed by EPA's cost estimating model and are included for illustrative purposes. The data, assumptions, and computational matheds underlying these values are such that EPA believes that the compliance cost estimates reported here are precise to two significant figures.

Exhibit 12-10
Compliance Cost Analysis Results for Management of Phosphogypeum from Phosphoric Acid Production^(a)

				3	Com	nonemental Code of Pegudotory Co	ny Compte	3		
	Const		Sabette C		3	LANGES C. ME.	3	•	Pubblic D. Plus	
Positiv	Amend Total (8 000)		Total Control of the]][115		Americal Total (\$ eec)	Total Captal	3 0 0
Agel Chem - Barton, Ft.	\$	016,71	80'08	13,640	11,780	101.08	98.0	11,645	64.067	980
Agates Chembed - McChemy, Fl.	1,067	41,300	220,616	108'07	20,436 136	110,017	16,560	11,906	66,627	6 ,942
Agates Chembed - Undo Sea, LA		25.8	24.35	727.57	96,381	343,615	51,257	62,242	352,204	52,553
Control Phosphates - Plant Chy, Ft.	1,847	165,043	85 X28	147,023	80.00	164,700	24,575	17,007	101,203	15,101
Channes - Rest Springs, WV	\$	10,885	56,316	•	1,270	2,696	20	3	975	131
Ourdinter - Phenders, P.	§	117,107	81,516	82,738	21.400	114,562	7.08	12,750	70,161	10,46
Mebil Miting - President, TX	2	46,86e	247,207	38.88	12,877	1.1	50.178	7,420	40,059	5,977
Ne-Beath Industrie - Percegnals, MB	92	2,42	330,400	99.300	13,080	900,330	10,346	7.414	40,255	900
No-West - Bade Springs, ID		8	22.74	. 383	S30.0	41,055	6,126	7.860	41,055	6.128
Ocatherial Chambed - White Sychon, Fl.		27,712	£0.0.	22.246	•	100,310	14.968	10,013	100,310	14,968
Republic - Publication, Fil.	ă	2 .15	356,960	20,562	13,362	20.7.5	10,562	7.001	41,436	6,182
	2011	82,23	330,082	8.7.750 8.7.8 8.338	2	8.39	15.547	15.10	816,313 60,463	137,024

in this table are these computed by EPA's east collimating model and are included for illustrative purposes. The data, assumptions, and computational ying these values are outh that EPA believes that the compilance cost estimates reported here are practice to two algulitzant figures.

potentially hazardous waste include those for which no sampling data exists. Facilities evaluated here as gar

Exhibit 12-11
Significance of Regulatory Compliance Costs for Management of Process Wastewater from Phosphoric Acid Production^(a)

		Subtitle C			ubtide C-Minu	•	•	Subtitle D-Plue			
Facility	CC/VOS	CC/VA	NR/K	CCNOS	CCNA	WW	CC/VOS	CCNA	IR/K		
Agel Chem - Barton, FL	1.00%	1.07%	16.0%	1.60%	1.77%	14.2%	1,57%	1.74%	14.2%		
Agrico Chomical - Donaldoomilla, LA	3.00%	3 40%	35.5%	2 95%	3.20%	33 2%	2 95%	3 20%	33 2%		
Agrico Chemical - Mulherry, FL	2.37%	3.74%	36.1%	3.23%	3.00%	32.4%	3.20%	3.56%	32.4%		
Agrico Chemical - Unclo Sem, LA	2.03%	3.14%	32.8%	2.73%	3.03%	30 0%	2.71%	301%	30 8%		
According - Golimos, LA	8.67%	4,09%	30.0%	3.53%	3.92%	38.8%	3.40%	3 84%	36 8%		
Control Phosphotos - Plant City, FL	3.91%	4.34%	43.2%	3.00%	4.10%	30 9%	3 60%	4.10%	30 9%		
CF Chantasis - Barton, FL	(L20%	7.00%	63.4%	8.02%	0.00%	57.3%	5.02%	6.50%	67.3%		
Chausen - Rock Springs, WY	2.47%	2.70%	23.1%	2.34%	2 00%	20.5%	2.28%	2 54%	20 5%		
Corosov - Muhala, FL	1.77%	1.07%	19.0%	1.00%	1.07%	14.1%	1.02%	1.00%	14.1%		
Farmland Industries - Beston, FL	1.00%	1.72%	14.9%	1.47%	1.43%	13.4%	1.45%	161%	13 4%		
Geretheler - Mirerviers, FL	4.07%	4.00%	44.1%	3.06%	4.27%	40.0%	3.02%	4.26%	40.6%		
MAC Fortilloor - Mulbony, FL	2.22%	2.40%	23.9%	2.10%	2.40%	22.7%	2.15%	2.39%	22 7%		
Mohill Mining - Passadoms, TX	9.00%	4.00%	30.4%	3.40%	3.00%	38.0%	3.43%	301%	36 O%		
No Bouth Industries - Passageula, IAB	4.77%	5.31%	56.7%	4.54%	5 00%	62.2%	4.40%	4.98%	52.2%		
No-West - Bods Springs, ID	2.01%	2.00%	20.0%	2.49%	2.70%	24.3%	2.44%	2.71%	24.3%		
Occidental Chamical - White Springs, FL	1.00%	2.20%	20.5%	1.90%	2.11%	10 0%	1 86%	2 09%	10 0%		
Royalor - Mulbarry, FL	2.47%	2.74%	24.4%	2.39%	2.01%	22.0%	2.31%	2.57%	22.0%		
Royster - Palmette, FL	6.09%	0.70%	73.0%	8.79%	6.43%	67.7%	5.73%	6 37%	67 7%		
Seminole Feeliker - Barton, FL	2.91%	3.23%	30 0%	2.90%	3.11%	27.7%	2.77%	3 00%	27.7%		
JR Simplot - Pocatelle, ID	2.49%	2.76%	24 0%	2 36%	2 62%	22 3%	2 31%	2 57%	22 3%		
Tenseguil - Aurora, NC	2.01%	2.24%	24 7%	1.03%	2.14%	23 0%	1.91%	2 13%	23 0%		

CC/VOS - Compliance Costs as Percent of Sales

FVK

CCNA - Compliance Costs as Percent of Value Added

- Annualized Capital Investment Requirements as Percent of Current Capital Outlays

(a) Values reported in this table are based upon EPA's compliance cost estimates. The Agency believes that these values are precise to two significant figures

use is in part discretionary, and selection of types and amounts of various fertilizer types can vary. Despite its fairly competitive position versus other world suppliers, therefore, the profit margins for phosphoric acid and phosphate rock may often be somewhat restricted.

Throughout the 1990's, domestic production of phosphoric acid is expected to remain constant, while foreign production is expected to increase by less than 2.5 percent per year. Both domestic and foreign demand for phosphoric acid are expected to grow by less than 2.5 percent per year during the 1990's.

Potential for Compliance Cost Pass-Through

Labor Markets. There has been considerable restructuring in the phosphate industry with some associated wage concessions. The potential for further labor concessions is not known.

Lower Prices to Suppliers. The ability to pass through costs to input markets is not particularly relevant because the major phosphoric acid producers are integrated.

Higher Prices. Higher prices are generally difficult to impose except during periods of worldwide prosperity. The price of phosphate rock and phosphoric acid depends a great deal on competition from Morocco, the price of alternative fertilizers, and the use of slow release fertilizers.

Evaluation of Cost/Economic Impacts

EPA believes that regulation of phosphogypsum as a hazardous waste under RCRA Subtitle C would impose potentially severe impacts on facilities at which this waste exhibits EP toxicity; the number of such facilities is highly uncertain but is at least one and likely to be two or three. Mitigation of the severe cost impacts that would be experienced by the affected phosphoric acid producers under Subtitle C would be unlikely, because of the limited potential for compliance cost pass-through (at least 10 of the 21 active domestic producers would experience no impacts), and the operational reality that a substantial quantity (approximately five tons) of phosphogypsum is generated for every ton of phosphoric acid produced using the wet process. Therefore. EPA believes that regulation of phosphogypsum as a hazardous waste could pose a threat to the continued operation of any producer whose phosphogypsum tested EP toxic. Regulation under Subtitle C-Minus would also impose significant impacts at most facilities. The prospect of regulation of phosphogypsum under the Subtitle D-Plus scenario examined here would be unlikely to pose a threat to the continued viability of the majority of the phosphoric acid facilities. For 18 of the 21 active producers, no significant impacts would be incurred in managing phosphogypsum under Subtitle D-Plus regulations. At least three facilities, however, and one in particular, would be expected to incur significant impacts in managing phosphogypsum even under Subtitle D-Plus, potentially posing a threat to the economic viability of these facilities. One of those three facilities, however, is currently planning/constructing a new stack which is expected to be lined and employ a leachate collection system; estimated costs in meeting Subtitle D-Plus requirements may therefore actually have been incurred by that facility while this report was being prepared; in that event, Subtitle D-Plus regulation would not impose any costs or impacts on this facility.

The Agency also expects that regulation of process wastewater as a hazardous waste under both Subtitle C and C-Minus regulation could potentially pose a threat to the economic viability of affected domestic phosphoric acid producers, based on estimated compliance cost impacts; estimated impacts under the Subtitle D-Plus scenario are marginally lower. Because, however, all producers are expected to be affected, there is a greater potential for passing through costs to consumers in the form of higher prices for domestically produced acid than there would be if phosphogypsum were to be regulated as a hazardous waste. Eight of the 21 facilities managing potentially hazardous process wastewaters are predicted to incur significant impacts under the Subtitle D-Plus scenario. The significance of these impacts, as discussed above, is diminished by the possibility of the operators reducing waste generation or physically separating waste streams generated

concluded in its analysis of NESHAPs for phosphogypsum stacks that this level of risk is "acceptable." ¹⁴² Consequently, EPA promulgated a work practice standard for radon flux from phosphogypsum stacks that the Agency "belives existing stacks meet... without the need for additional control technology." ¹⁴³

Likelihood That Existing Risks/Impacts Will Continue in the Absence of Subtitle C Regulation

At many active phosphoric acid production plants, current waste management practices and environmental conditions may allow contaminant releases and risks in the future in the absence of Subtitle C regulation. For example, the stacks and ponds are typically unlined and in the Southeast, where the phosphoric acid industry is most heavily concentrated, and ground water occurs in relatively shallow aquifers. While these surficial aquifers are not typically used for drinking water purposes, they frequently are hydraulically connected to aquifers or surface waters that supply drinking water. Similarly, catastrophic stack and dike failures and long-term seepage from stacks and ponds have released process wastewater and phosphogypsum constituents directly from management units to surface waters. Therefore, environmental releases can occur and, considering the intrinsic hazard of the wastes, significant exposures could occur if contaminated ground water is used as a source of drinking water.

The phosphoric acid production industry recently has been recovering from low production levels in the mid-1980's and may continue to expand somewhat in the future if fertilizer use continues to grow in response to increases in crop prices and planted acreage. Increases in production would likely be provided by increased capacity utilization at active plants (e.g., in 1988 three plants operated at utilization rates of 16 to 38 percent) and the reactivation of plants that are presently on standby. Therefore, if phosphoric acid production does increase, use of existing waste management units (both those at facilities evaluated in this analysis and those at idle facilities that were not included in this analysis) would expand, potentially increasing release potential and posing greater threats to human health and the environment. However, given the large quantities of these wastes, and the ban of off-site use of phosphogypsum, 144 it is unlikely that these wastes will be used or disposed in significant quantities at off-site locations in the future.

State regulation of phosphoric acid production wastes varies considerably among the seven states in which active plants are located, but requirements in most states may not be sufficient to control releases from existing units and prevent threats to human health and the environment. For example, relatively comprehensive solid waste regulations in Louisiana and Florida (under development) require liners and specify closure requirements for new and expansions of existing stacks, but the state programs provide controls for releases from existing units only through requirements for ground-water monitoring and performance standards that in some cases allow off-site contamination. In North Carolina, phosphogypsum and process wastewater are not defined as solid wastes, and are not subject to any solid waste regulations, though discharges from waste management units must be permitted under the state's EPA-approved NPDES program. In summary, state regulatory controls may not be sufficient to prevent releases of phosphogypsum and process wastewater constituents from existing units, and in only a few states are regulations that specify construction and operation standards in place or under development.

Costs and Impacts of Subtitle C Regulation

EPA has evaluated the costs and associated impacts of regulating both phosphogypsum and process wastewater from phosphoric acid production as hazardous wastes under RCRA Subtitle C. EPA's waste characterization data indicate that phosphogypsum exhibited the hazardous waste characteristic of EP toxicity at only one of the eight active facilities for which sampling data were available. EPA's data also indicate that

^{14 54} FR 51675. December 15, 1989.

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¹⁰⁴ Ibid.

will now be disposed on-site, regardless of the RCRA requirements that may be applied to such disposal, i.e., regulation under Subtitle C would affect only the costs of phosphogypsum management, not the type(s) of management techniques employed. Direct recycling of phosphogypsum for additional product recovery is not a viable option, and process changes that might affect the chemical properties of the material as well as purification methods have been employed with variable success. It is likely that in response to new regulatory requirements, facility operators would develop and implement measures to render their phosphogypsum non-EP toxic. Process wastewater is currently internally recycled at all active facilities. The potential for reducing the amount of water used and/or significantly reducing the total quantities of corrosive or otherwise hazardous substances currently found in process wastewater is extremely limited, given the nature of wet process phosphoric acid production operations.

HYDROLOGIC IMPACTS OF PHOSPHATE
GYPSUM DISPOSAL AREAS IN CENTRAL FLORIDA

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HYDROLOGIC IMPACTS OF PHOSPHATE GYPSUM DISPOSAL AREAS IN CENTRAL FLORIDA

1.0 INTRODUCTION

Large quantities of phosphate rock are mined and processed in Central Florida (Figure 1). The phosphate rock from the mines is further processed in "chemical plants" to produce phosphoric acid (Figure 2). A by-product of the processing of the phosphate rock to produce fertilizer chemicals is an impure form of gypsum referred to as phosphogypsum. For each ton of phosphate rock processed, approximately 1.5 tons of phosphogypsum is produced (Figure 3). The typical method to dispose of this by-product gypsum is to stack it in large piles, locally referred to as gypsum stacks or gypsum fields (Figure 4).

These gypsum stacks have been the focus of many studies in recent years in an attempt to identify the potential for ground water and/or air pollution associated with the stacks. This paper attempts to discuss some of the ground water impacts and current attempts to minimize these impacts.

2.0 BACKGROUND

Initially, phosphate chemical plants produced diamonium superphosphate and waste disposal was minimal. However, since the early 1920's and 1930's when chemical plants first began to clarify and upgrade the P2O5 content of the phosphoric; acid to produce triple superphosphate and diamonium phosphate, the quantities of waste gypsum to be disposed increased substantially. During this 30 to 40 year time period, vast

quantities have been stored in this manner. At present there are approximately 17 gypsum stacks/fields located in the central Florida phosphate district (Figure 5). These gypsum stacks are not unique to central Florida and are located throughout the United States. Anywhere phosphoric acid is produced, one of these stacks occur. Presently there are gypsum stacks in Louisiana, Mississippi, Missouri, Texas, North Carolina and in many of the western states. A few of these gypsum stacks are inactive, but most are presently being used.

3.0 GENERAL CHARACTERISTICS

As you would expect, most gypsum disposal stacks are located as close as possible or practical to the chemical plant in order to keep pumping costs to a minimum and often are located adjacent to the mining area (Figure 6 and 7). A typical gypsum stack is 400 to 600 acres in size and has an associated cooling water pond of approximately 250 acres in size (Figure 8). The gypsum slurry is transported from the chemical plant to the top of the stack using acidic process water. The gypsum slurry is deposited on the top of the stack, the gypsum settles out and the process water is reused (Figure 9). The process water used to transport the gypsum to the top of the stack is recirculated to the plant generally via the cooling water pond. This process/cooling water is acidic, containing sulfuric and phosphoric acid from the digestion of phosphate rock with sulfuric acid.

In most cases runoff from the side slopes of the stacks is collected in ditches surrounding the perimeter of the stacks.

The process water is returned to the chemical plant for reuse in unlined ditches or pipelines (Figure 10).

Typically once the stack reaches a height of 100 to 150 feet in height, another stack is started in a new location and/or the existing one is expanded (Figures 11 and 12). However, due to difficulties in obtaining permits, some stacks recently are proposed for heights of up to 200 feet (Figure 13).

In the past these plant facilities were generally located in areas away from population centers. However, in recent years, Florida has experienced unprecedented growth and areas which were once remote and removed from population centers are now being surrounded as the suburbs extend out from the cities.

In the late 70's and 80's our environmental awareness increased by reported ground-water pollution. The environmental regulatory agencies have focused on gypsum stacks as a potential pollution source. As a consequence of this interest in gypsum stacks, numerous studies have been conducted in the recent past. These studies have been commissioned by various industry and regulatory interest such as the Florida Phosphate Council, Florida Institute of Phosphate Research (FIPR), the Florida Department of Environmental Regulation (FDER), the U.S. Environmental Protection Agency (EPA) and the pursuit various operating companies in of permits for construction or operation of new and existing facilities.

4.0 HYDROLOGIC SETTING IN THE CENTRAL FLORIDA AREA

The upper surficial aquifer and the floridan aquifer are the principal ground water sources in central Florida (Figure 14). In most instances these two aquifers are separated by a confining bed which may have an intermediate aquifer system. Underlying the lower Floridan aquifer is another confining bed. The upper surficial or water table aquifer is principally composed of sand, clayey sands and in some areas shell and gravel beds.

The Floridan aquifer consists principally of porous limestones. The confining units are generally sandy or silty clays, clays and marls; and/or dense limestones and dolomites or dolosilts.

The surficial aquifer is unconfined and rises or falls in response to rainfall and discharges to streams and underlying aquifers. The water level of the surficial aquifer lies below the land surface generally from about 4 to 10 feet in the area of most of the gypsum stacks.

The water in the Floridan aquifer is generally confined. Recharge to the Floridan aquifer is principally by lateral flow, leakage through confining beds and recharge in Karst regions of Florida (Figure 15). Fortunately, most gypsum stacks are located in an area of low recharge to the Floridan aquifer. The general natural flow of ground water in the central Florida phosphate district is southwestward toward the Gulf of Mexico (Figure 16). Since about 1975 the U.S. Geological Survey (USGS) has monitored and mapped the wet and dry season potentiometric level of the

Floridan aquifer. During the winter months agricultural pumpage in south central Florida can reverse the discharge flow (Figure 17).

The sandy surficial sediments which comprise the water table (surficial) aguifer are typically 5 to 50 feet in thickness (Figure 18). These surficial sediments are underlain by 20 to 80 feet of inner-bedded phosphatic, sandy, shelly, clayey, marley sediments that comprise the Pliocene Bone Valley formation. The Miocene Age Hawthorn Formation underlies the Bone Valley Formation. The Hawthorn is an impure marine dolomitic limestone which contains varying concentrations of phosphate and quartz sands, clay, marl and dolomite and ranges in thickness to upwards of 100 feet. In many areas the lower portion is an intermediate aquifer producing zone. Underlying the Hawthorn is the Miocene Tampa Formation. The Tampa is similar to the Hawthorn but contains less dolomite and has more clay beds. The Tampa ranges from a few feet in thicknesses to upwards of a 100 feet thick. Portions of the upper Tampa and lower Hawthorn formations are the principal intermediate aquifer systems. Underlying the Tampa is a thick sequence of Oligocene to Eocene aged limestones. limestones are hundreds of feet in thickness and comprise the principal Floridan aquifer. Granular evaporites generally underlie the Floridan aquifer.

5.0 RESULTS OF PREVIOUS STUDIES

The most widely published and easily available studies for review are those which were conducted by the USGS beginning in late 1978 and published in 1984. The data were initially published in 1982 and the evaluation of the data being made available approximately 2 years later. As a result of monitoring the ground water around these stacks, FDER has noted ground water violations at many sites as noted in Table 1 and Figure 19.

Recently the USEPA has distributed a Preliminary Draft EIS Supplement to the Central Florida Phosphate area wide EIS. This preliminary draft EIS addresses gypsum disposal systems.

Most studies including the USEPA Draft EIS have indicated that the surficial ground water impacts are generally restrained to an area within 500 to 1500 feet of the gypsum stack (Figures 20, 21 and Table 2). In some cases the intermediate aquifer has been slightly impacted.

6.0 WATER CHARACTERISTICS

The processed water from the chemical plants which is used to slurry the gypsum to the disposal area is highly acidic (ph of 1.4 to 1.8) and has a high dissolved-solids concentration at about 28,000 parts per million (ppm). The predominant contaminants are sodium, phosphate, fluosilicates, hydrogen and sulfate (Table 3).

Native ground water has a dissolved-solids concentration of approximately 500 parts per million with a ph which is generally less than 7.0.

Migration of radionuclides, fluosilicates, phosphates and trace metals are easily parcipitated as the acid is neutralized by the carbonate in aquifer fabrics.

Recent monitoring data for some operating plants indicates the chemical front is slowly creeping out from the field as the "carrying or absorptive properties" of the aquifer fabric is reached. As a result of the increasing chemical fronts, regulatory agency personnel are putting increasing pressure on the operators to contain/prevent the leaking of process water from the gypsum stacks.

7.0 APPROACHES TO DEAL WITH THE POTENTIAL FOR GROUND WATER CONTAMINATION IN GYPSUM DISPOSAL FIELDS

In the past, the gypsum disposal fields were constructed either on natural unmined land or in many cases they were constructed directly in the mined lands associated with the phosphate mining process. This meant that the gypsum was

deposited directly upon the existing land surface or on the top of the Hawthorn Formation (Figure 22). However, during the past 10 to 15 years, several approaches have been taken to locate the stacks in areas which would alleviate the potential for ground water contamination or to construct the stacks in such a way as to reduce or eliminate the potential for ground water contamination. Initially, to protect the surface water ditches were dug around the stacks to collect the runoff and seepage from the side slopes of the stacks. This was effective to collect the surface water runoff from the gypsum disposal areas.

In the early 80's attempts were made to site stacks in areas where naturally occurring thick clays could be used as a natural liner (Figure 23). In some areas of the central Florida district, the Hawthorn Formation is very impermeable and is quite thick. In the early 80's USS Agri-Chemicals used a modification of this approach in an area where the Hawthorn was very impermeable and waste clays existed (Figure 24). In addition, a ditch was dug around the stack to prevent lateral migration of leachate (Figure 25). However the water level in the ditch had to be carefully controlled to prevent migration of contaminated ground water from the stack into the surrounding surficial aquifer.

In the mid 80's Gardinier proposed an extensive system consisting of a compacted clay liner and underdrains overlying a thick sequence (15-20') of naturally occurring Hawthorn clays in their permit application for a new gypsum stack. This was a very elaborate system of underdrains, liners, slurry walls, etc.

(Figures 26, 27 and 28). Due to the Gardinier Chemical Plant's location on the Tampa Bay and proximity to nearby population centers, these measures were required to insure that the stack would be permitted and that the ground water would be protected. More recently, IMC Fertilizer (IMCF) has proposed to construct a new gypsum disposal stack. Initially IMCF proposed more conventional stack construction techniques where the stack would be built directly upon the Hawthorn formation in a mined out area. Recently, due to increasing pressure from the regulatory agencies they have revised their plans and proposed to install a synthetic liner beneath the stack and a slurry cutoff wall along portions of the cooling water pond (Figures 29, 30 and 31). The FDER is presently considering that all new gypsum stacks constructed in Florida will require a liner to protect the ground water.

8.0 SUMMARY

In summary, recent studies have indicated that there are some potential ground water impacts associated with phosphogypsum disposal areas in Florida. Most of these studies have indicated that the lateral ground water impacts to the surficial aquifer system extend beyond the existing non-lined gypsum disposal stacks for a distance of approximately 1500 feet. In some cases contamination has been reported in the intermediate aquifer system. The various regulatory agencies including USEPA, FDER and various state and local governments have continued to increase the pressure for permit applicants to design gypsum

stacks which will protect the groundwaters of the state. In the past ten (10) years gypsum stacks have been designed and sited so as to use the natural confining layers and buffering sediments which occur in Florida; designed artificial compacted clay liners and slurry walls; and more recently recommended synthetic membranes overlying the natural confining carbonate sediments to mitigate and control the leachate from gypsum disposal systems. The proposed phosphate area wide draft EIS is proposing even more stringent conditions upon siting of gypsum disposal fields and recommending closure procedures for existing stacks. The results of ground water monitoring for these newly proposed stacks once constructed will be used to determine the next generation of controls and constraints which will be applied to gypsum stack permit conditions.

TMG\GYPSUM.PPR

TABLE 1
REGULATORY STATUS OF PHOSPHOGYPSUM STACKS

			INTERMED FLORIDAN		SURFICIAL	AQUIFER	ENFORCEMENT	POTABLE	EXPANSIO APPLI	N PERMIT	EXTENDED
FACILITY NAME	ACTIVE	INACTIVE	PRIMARY AND SECONDARY WOLATION	SECONDARY MOLATIONS ONLY	PRIMARY AND SECONDARY VIOLATION	SECONDARY MOLATIONS ONLY	ACTION INITIATED	WELLS WITHIN 1/2 MILE	ISSUED	WITHDRAWN	ZONE OF DISCHARGE
C.F. INDUSTRIES	X				x		x		,		
CENTRAL PHOSPHATES	x		x		x		x	x		x	
CONSERVE	X				×		x	x			
FARMLAND INDUSTRIES	X			·	x		x	x			
GARDINIER	X			_			×				
AGRICO CHEMICAL	×				x		x				×
AMERICAN CYNAMID		x			×						
INC NEW WALES	×		X								
ROYSTER, PINEY POINT	x				x						
SEMINOLE FERTILIZER	x		x		x		x	x			
USSAC, BARTOW		x			, x			x			
USSAC, FORT MEADE	X					x		x			
ESTECH		x			x						
IMC P-21		x				· x					
ROYSTER, MULBERRY	x					×			x		

SOURCE: USEPA DRAFT CENTRAL FLORIDA PHOSPHATE AREA MDE EIS SUPPLEMENT.

DRING: CFRP9CHT

TABLE 2

DRINKING WATER STANDARDS: DISTANCE TO EXCEEDANCE OF LIMITATION

	Drinking	Limitation		~	proximate nce Distance	
Constituent	Water Standards	mg/l	Royster	WR Grace	Conserv	USSAC
Silver (Ag)	Primary	0.05	50 ^a c	100°a	` 80 ^a ,	50 ^a
Arsenic (As)	Primary	0.05	200, ^r	300 ^t	500 ^b ;	800°
Chromium (Cr)	Primary	0.05	300°	600 ^e	1200 ^b	400 ^f
Cadmium (Cd)	Primary	0.01	200 ¹	600 ^e	850 ^b	
Lead (Pb)	Primary	0.05	50 ^a	100 ^a	300 ^e	1050° 50°
Fluoride (F)	Primary	1.6	50 ^a	100 ^a	300 ^e 80	
Selenium (Se)	Primary	0.01	50 ^a _	100 ^a ,	80 ^a .	50 ^a
Iron (Fe)	Secondary	0.3	1000 ¹	600 ^d	580 ^d	1800
Sulfate (SO,)	Secondary	250	800 ¹ 2	600 ^d	580 ^d	1800
Total Dissolved	Secondary	500	1000 ^r	600 ^a	580 ^d	1800 ⁶
Solid (TDS)	·			•	•	
Manganese (Mn)	Secondary	0.05	1100 ^e	600 ^a	580 ^d	1800 ^e

^aConcentration below DWS within given distance

Source: USEPA Draft Phosphate Areawide EIS Supplement

bDistance determined by applying linear regression to all downgradient wells

^CDistance determined by applying linear interpolation between downgradient wells

dElevated concentration above DWS at most distant monitoring well

eConcentration slightly above DWS and probably exceeds beyond given distance

f Distance estimated using water quality data and distribution of monitoring wells

Insufficient data

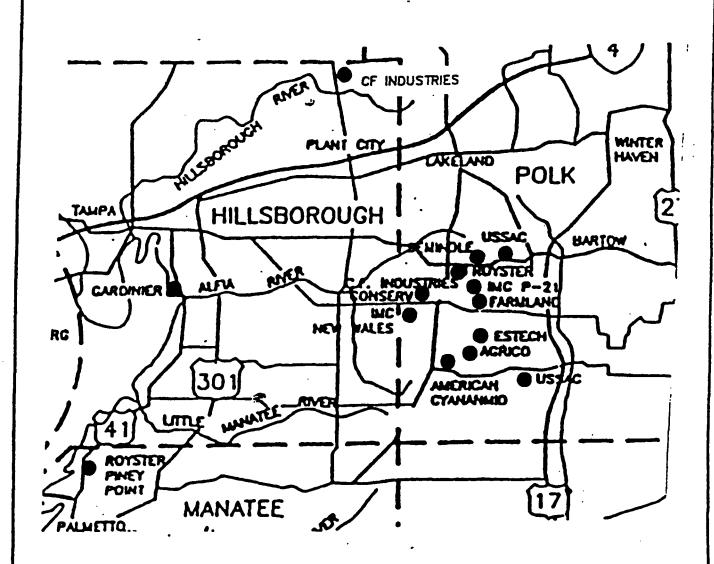
TABLE-3 CHEMICAL AND RADIOLOGICAL COMPOSITION OF TYPICAL PHOSPHATE CHEMICAL PLANT POND WATER

		Vater
•		
	04-03-87	09-18-87
>6.\$	1.4	1.6
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	1,000	, r
		×
		· x
		x
ns	40,000	36,650
AS .	- 3,622	*
500	38,350	43,293
250	5,728	4,216
4.0	9,400 .	9,000
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		. 159
. DS	80.0	x
	. •	٠.
-		x
		X
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as .	1,248	- 1,076
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		271
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•		
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		X
		6.33
		r
		ž
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0.05	1.52	×
63	<0.00S .	X.
		252
		x
		x
as	1.40	×
0.01	0.006	. ¥
0.05	0.06	9.06
RS	0.63	x
5.0	4.79	×
es .	200	×
		X
4.14	~.447	•
	_	
15		×
Combined)		×
	7.1-0.3	*
	15 1 1 -0.2 to +0.2 0.5 ns as 250 ts ns ns 160 ns 160 ns	36.5 1.4 1.5 1.0000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000

x: Parameter not measured.

ns: Not specified.
MCL: Section 17-22,210 and 17-22,220 FAC Maximum Contaminant Level.

FIGURE 5 LOCATION OF CHEMICAL PLANTS AND GYPSUM STACKS IN THE CENTRAL FLORIDA PHOSPHATE DISTRICT

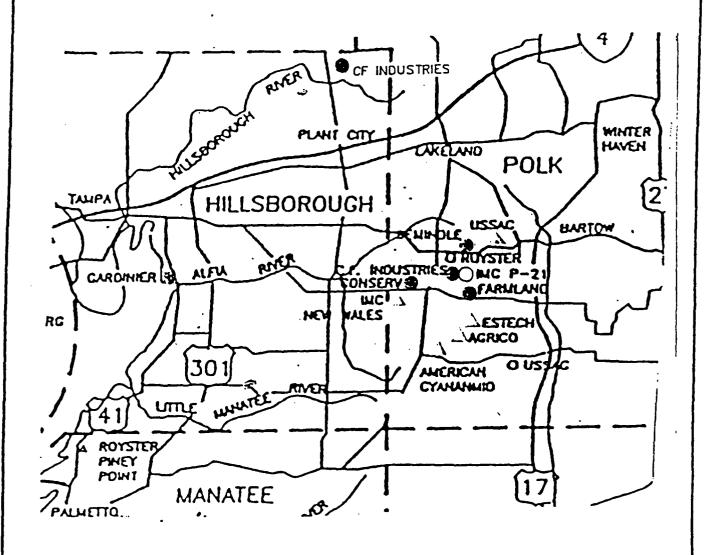


FACILITY LOCATION

ONC: CEBBOI CO

FIGURE 19

REGULATORY STATUS OF GYPSUM STACKS IN CENTRAL FLORIDA PHOSPHATE DISTRICT



- O NO CURRENT GROUNDWATER VIOLATIONS
 - PRIMARY STANDARD VIOLATIONS AT THE PROPERTY BOUNDARY OR IN THE INTERMEDIATE/ FLORIDAN AQUIFER
- UNDER INFORCEMENT FOR GROUNDWATER OR SURFACE WATER VIOLATIONS

DRWG: CFKP9RSC

KIRK-OTHMER

ENCYCLOPEDIA OF CHEMICAL TECHNOLOGY

THIRD EDITION

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VOLUME 17

PEROXIDES AND PEROXY COMPOUNDS, INORGANIC TO PIPING SYSTEMS



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direct methods of flame spectroscopy are used for low concentrations of phosphorus. Fluorometry, spark-source mass spectroscopy, infrared spectroscopy, electron spectroscopy, and nuclear magnetic resonance spectroscopy have also been employed (see Analytical methods).

Environmental Considerations

Inorganic phosphates present no hazard to humans and are essential to life processes. However, phosphorus creates environmental problems, mainly because its availability increases the growth of algae in many lakes. In recent years, considerable controversy has centered upon the contribution of phosphate-built detergents to excessive algae growth and subsequent eutrophication of natural receiving waters. Minnesota, Wisconsin, Michigan, Indiana, New York, Vermont, and Akron, Ohio, Chicago, Ill., and Dade Co., Fla., have legislated against the use of phosphorus in detergents, resulting in a patchwork of restrictions. No two sets of regulations are exactly alike; some restrict only home laundry detergents, others cover a range of household and commercial cleaning products.

Problems apparently caused by sewage-borne phosphates are mostly localized to areas that have traditionally employed lakes as receiving waters for sewage effluents. Average phosphorus concentrations vary in municipal sewage for several reasons, including industrial waste input, storm waters, seasonal fluctuations, and daily living-habit cycles. Extreme values range between 3 and 15 mg/L (typical 5–9). The chemical form of phosphorus in waste varies, including soluble orthophosphates, condensed phosphates, insoluble salts, and numerous forms of organic phosphorus. Activated-sludge treatment considerably reduces the condensed phosphates to orthophosphates. Thus, the principal inorganic phosphorus input to receiving waters via sewage effluent is orthophosphate. It is believed that much of this is precipitated as inactive phosphorus, which is trapped in sediments where it is ultimately converted to an apatite.

The growth of algal nuisance blooms is complex and appears to involve a symbiotic relationship between algae and bacteria. Sewage effluent, treated or raw, provides an excellent growth medium for both organisms. There is little doubt that phosphorus is one of the nutrients supplied. It is open to question, however, as to whether a banning of phosphate detergents and cleaners sufficiently reduces phosphorus input to the very low levels needed to control algal growth when, in fact, natural wastes and fertilizers provide most of the phosphorus input to receiving waters. A more logical, but more costly, approach is phosphorus removal during sewage treatment.

Investigation of the effects of phosphorus on the environment is in its initial stage; the issue is further complicated by the lack of an adequate data base. Mankind cannot prohibit phosphorus, as it is an essential part of the natural order of the world. However, it has to be controlled when necessary. The simplistic approach of legislating detergent phosphates, although helpful in some isolated cases, does not accomplish this goal. An excellent review of this area is available (10).

BIBLIOGRAPHY

"Phosphoric Acids and Phosphates" in ECT 1st ed., Vol. 10, pp. 403-441, by John R. Van Wazer, Monsanto Chemical Company; ECT 2nd ed., Vol. 15, pp. 234-276, by John R. Van Wazer, Monsanto Company.

STATE OF FLOF DEPARTMENT OF ENVIRONM

SOUTHWEST DISTRICT

PERMITTEE

Mr. John G. Cladakis Senior Vice President CONSOLIDATED MINERALS, INC. Post Office Box 908 Palmetto, FL 33561 PERMIT/CERTIFICATION

ID Number: 4041P20001... Permit No.: IO41-129068

Permit No.: 1041-1290688533 Expiration Date: May 117 199

County: Manatee

Latitude: 27° 37' 24" Longitude: 82° 31' 54"

Project: Phosphatic Fertilizer,

Plant Wastewater
Treatment and Discharge

This permit is issued under the provisions of Chapter 403, Florida Statutes, and Florida Administrative Code Rules 17-3, 17-4 & 17-6. The above named permittee is hereby authorized to perform the work or operate the facility shown on the application and approved drawing(s), plans, and other documents, attached hereto or on file with the department and made a part hereof and specifically described as fexlows:

The facility consists of phosphoric acid, sulfuric acid and diammonium phosphate plants. Calcium sulfate, which is generated as a by-product in the phosphoric acid production process, is stored at the site. The calcium sulfate transport water and scrubber water from the phosphoric acid and diammonium phosphate plants make up the process wastewater. This stream is ponded and, to the extent possible, reused. Contaminated non-process wastewater is discharged through Outfalls 001 and 002 and the process water which cannot be recycled is treated and discharged through Outfall 003. Process wastewater treatment consists of double-liming and further steps for which confidentiality has been claimed in accordance with Section 403.111, Florida Statutes. Outfalls 001 and 003 discharge to Buckeye Road drainage ditch, which becomes confluent with a southerly flowing railroad drainage ditch, which ultimately discharges into Bishop Harbor, which flows into Tampa Bay. Outfall 002 discharges to a drainage ditch and thence to Piney Point Creek, which empties into Tampa Bay. The groundwater monitoring requirements of Section 17-4.245 of the Florida Administrative Code (F.A.C.) are addressed in this permit.

Location: Immediately east of U.S. Highway 41 and approximately six (6) miles north of Palmetto, Manatee County, Florida.

Replaces Permit No.: IT41-85866B

DER Form 17-1.201(5) Page 1 of 13.

when the Order (Permit) is final, any party to the Order had the right to seek judicial review of the Order pursuant to Section 120.68, Florida Statutes, by the filling of an Order Appeal pursuant to Rule 9.110, Florida Rule soft appealing Procedure, with the Clerk of the Department in the Office of General Counsel, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400; and by filing a copy of the Notice of Appealing accompanied by the applicable filing fees with the appropriate District Court of Appeal. The Notice of Appeal must be filed within 30 days from the date the Final Order is filed with the Clerk of the Department.

Executed in Tampa, Florida.

Sincerely,

Henry B. Dominick Permitting Engineer

Industrial Waste Program

HBD/aa

Attachment: As stated

cc: W. L. Priesmeyer, MCHD

Southwest District Groundwater

CERTIFICATE OF SERVICE

This is to certify that this NOTICE OF PERMIT and all copies were mailed before the close of business on May 15, 1987 to the listed persons.

FILING AND ACKNOWLEDGEMENT FILED, on this date, pursuant to Section 120.52(10), Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.

moela d'Undre, 05/15/87
Clerk Date

. Geraghty & Miller, Inc. 82 * 32 SEABOARO COAST ----------17 2 6 DIAMMONIUM PHOSPHATE POND DITCH 27 938 CHEMICAL PLANT m MW−4 COOLING

BUCKEYE

1000

APPROXIMATE

MW-2

ROAD

SCALE

2000 FEET

EXPLANATION

MW-1 NEWLY INSTALLED SURFICIAL AQUIFER MONITOR-WELL LOCATION AND NUMBER

PONDS

MW-2 EXISTING SURFICIAL AQUIFER MONITOR-WELL LOCATION AND NUMBER

MW-7 EXISTING INTERMEDIATE AQUIFER MONITOR-WELL LOCATION AND NUMBER



337

SOUTH WEST DISTRICT

February 25, 1987-

Mr. Dale Twachtmann
Secretary
Florida Department of
Environmental Regulation
Twin Towers Building
2600 Blair Stone Road

RE: Request for Conductivity Variance
AMAX Chemical Corporation, Piney Point Complex
Industrial Wastewater Permit

Dear Mr. Twachtmann:

Tallahassee, FL 32301

AMAX Chemical Corporation is currently operating its industrial wastewater system under temporary operating permit number IT41-85866 B which expires March 4, 1987. Application for an operating permit was filed on January 2, 1987. Included in the existing permit is a variance for specific conductivity, granted for Outfall 003 under DER File No. VE-41-181 which expires April 25, 1987. AMAX Chemical Corporation is hereby applying for a renewal for Specific Conductivity at Outfall 003.

AMAX's Piney Point Complex is located in the northwest section of Manatee County, approximately one-quarter mile inland from Tampa Bay. The Complex has three surface water outfalls; two are non-process discharges (001 and 002) and the third (003) discharges treated process water. One non-process outfall (002) flows northward into Cockroach Bay, a saltwater estuary, while the other non-process outfall (001) and the treated process water outfall (003) flow southward into the marine waters of Bishop Harbor.

The receiving water for the south surface outfalls (001 and 003) is a man-made roadside drainage ditch that flows initially westward for approximately 600 meters below the AMAX outfalls and turns south in a railroad drainage ditch for approximately 1900 meters where it enters Bishop Harbor. This salt water body is typical of Plorida marine waters and has conductivity values well in excess of AMAX's effluent.

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Secretary
Florida Department of
Environmental Regulation
February 25, 1987
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AMAX requests that the Department grant a variance from the requirements of 17-3.06(2)(0), Florida Administrative Code and 403.201, Florida Statutes, to allow the discharge of water with higher conductivity than allowed by the Water Quality Standards established for Class III waters of the State. Paragraph 17-3.061(2)(0) F.A.C. states: "Specific Conductance -- shall not be increased more than 100% above background levels or to a maximum level of 500 micromhos per centimeter in surface waters in which the specific conductance of the water at the surface is less than 500 micromhos per centimeter; and shall not be increased more than 50% above background level or to a maximum level of 5,000 micromhos per centimeter in surface waters in which the specific conductance of the water at the surface is equal to or greater than 500 micromhos per centimeter but less than 5,000 micromhos per centimeter."

The background specific conductance of the receiving water, based on an average of maximum values over the past eleven (11) months, is 1,468 micromhos per centimeter. The specific conductance of the treated process water discharge is approximately 4,400 (average) and 5,500 (maximum) micromhos per centimeter.

Approximately 2,500 meters downstream the receiving body mixes with the salt waters of Bishop Harbor. Although we have not performed recent studies on conductivity values in Bishop Harbor, it is a well known fact that salt water values are considerably higher than found in the AMAX discharge waters. Work carried out by the company in 1983 and 1984 found that specific conductance values in Bishop Harbor varied between 10,000 and 40,000 micromhos per centimeter approximately 2,500 meters downstream from the AMAX discharge. It is not believed that AMAX's discharge will significantly affect the naturally occurring high specific conductance values in Bishop Harbor. AMAX employs double-lime treatment and an ammonia removal process prior to discharging treated process water. There appears to be no economical method for further reducing the specific conductance of the treated process water effluent.

Anticipating additional questions AMAX offers the following 403.201 Florida Statute response:

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1. We believe that this variance request is made pursuant to Chapter 403.201(1)(a) and (c). There is no practicable means known or available for adequate control of the pollution involved. As important, however, even if such means existed, is the fact that it would be impractical from both economic and environmental standpoints to reduce the specific conductance in the discharge to within allowable limits in the receiving body of water because within 2,500 meters, it enters Bishop Harbor where specific conductance values range from 10,000 to 40,000 micromhos per centimeter. The effluent flow route is described above. Thus, even if practicable water treatment technology becomes available to reduce the specific conductance of the effluent, no environmental improvement would result from the company installing such treatment technology.

AMAX investigated water treatment alternatives to reduce the levels of conductivity in the treated process water discharge in 1984 which included ion-exchange, reverse osmosis, dilution and other treatment technologies. None of the technologies available could be practically applied. Additionally, current inquiries have revealed no breakthrough techniques. AMAX believes that this explanation supports the applicability of sub-paragraphs (a) and (c).

- AMAX requests a long term variance (at least life of permit) supported by the following.
 - a. This ditch/canal system used to transport the effluent from the NPDES outfalls to Bishop Harbor is not a natural system containing high levels of habitat diversity. These waterways were built to drain Buckeye Road, U.S. Highway 41, a railroad line, and agricultural fields used for pasture, sod growing, tomatoes, ornamentals and citrus. Flow upstream of AMAX's outfalls contains elevated levels of conductivity when irrigation runoff or rainfall triggers a flow event.
 - b. No adverse effects will result in the Bishop Harbor ecosystem as a result of AMAX's effluent as it already contains naturally occurring elevated levels of specific conductance.

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- c. Current technology to reduce specific conductance levels in the effluent is not practicable. Even if such technology becomes available, the need to reduce specific conductance levels is not appropriate because AMAX's effluent contains insignificant levels when compared to water in Bishop Harbor.
- 3. What level of specific conductance can be met in the treated process water discharge?

Untreated process water has conductivity values of approximately 9,000 micromhos per centimeter. Double-lime treated process water typically contains less than 6,000 micromhos per centimeter. AMAX's experience utilizing its proprietary tertiary treatment system ranged from 3,700 to 5,500 micromhos per centimeter. During this entire period of data collection the production facilities have been shut down. Allowing for variation during normal operation continues to suggest a level of 6,000 micromhos per centimeter as a reasonable level of specific conductance.

Thus, we believe the variance should be issued authorizing the release of treated process water less than 6,000 micromhos per centimeter.

17-103.100 Response:

- a. addressed above
- b. addressed above
- c. addressed above
- d. addressed above
- e. addressed above
- f. and g. require a discussion of the social, economic and environmental impacts on the company, residents of the area and of the state if the variance is granted or if the variance is denied. The following addresses these issues:

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Social Impacts: The ditch/canal system functions principally to drain land in support of agricultural, transportation, and manufacturing activities. Pishing and other recreational uses have not been observed by AMAX in the ditch system because most residents choose to do so either in larger freshwater streams where flow is continuous or in Bishop Harbor where no environmental impacts will be caused by issuance of the variance. Thus, AMAX cannot identify any significant social impacts upon area residents or the state caused by issuance of the variance.

Denial of the variance also would have limited potential impacts upon residents of the area and the state. As described above, denial of the variance would not result in an ecosystem capable of supporting commercial or recreational uses of the ditch/canal system which are not present currently. Because Bishop Harbor will not be impacted by Department action upon AMAX's request, denial of the variance would have no favorable social consequences upon residents of the area or the state.

Economic Impacts: The principle impact of the Department's decision is economic. Due to the environmental characteristics of the ditch/canal system and Bishop Harbor, a requirement to soften the effluent (should the variance be denied) will impose an unnecessary, multi-million dollar hardship on a facility that has not produced for economic reasons since January, 1985. Denial of the variance will not create an ecosystem capable of generating economic gains to offset AMAX's hardship.

Environmental Impacts: AMAX believes denial of the variance, independent of the question of available treatment technology, would not produce significant environmental benefits because the receiving ditch/canal system is man-made, intermittent, of low ecological diversity, and contains elevated conductivity values due to upstream activities as well as tidal effects in the ditch/canal.

Once AMAX's effluent reaches Bishop Harbor, approximately 2,500 meters downstream of AMAX's NPDES outfalls, no environmental benefits would accrue from denial of the variance because the marine waters of Bishop Harbor contain specific conductance levels far greater than AMAX's effluent. Thus, the environmental benefits of denial are limited to the 2,500 meters of ditch/canal system constructed to drain runoff from agricultural lands, highways, and a railroad. It is difficult to identify meaningful environmental benefits in this case.

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Issuance of the variance will result in the conductivity of the canal/ditch system to increase somewhat for 2,500 meters of its length, where mixing with water from Bishop Harbor will cause the conductivity levels to rise to 40,000 micromhos per centimeter. Because it is highly unlikely that aquatic organisms in the canal system are not acclimated to marine waters, issuance of the variance should not adversely affect the aquatic diversity.

The probability of any reduction in diversity is also slight because intermittent flow in the system has already prevented the development of a highly diverse natural ecosystem. Equally important is the system's history of receiving agricultural and highway runoff containing elevated levels of conductivity.

Thus, AMAX believes environmental impacts from issuance of the variance will be limited to theoretical discussions which will be unsupportable by field evidence.

We feel the evidence strongly supports the extension of our request for extending, long term, a variance for specific conductance. If you have any questions, please let me know. Your prompt consideration is appreciated.

Yours very truly,

John G. Cladakis

Senior Vice President and Operations Manager

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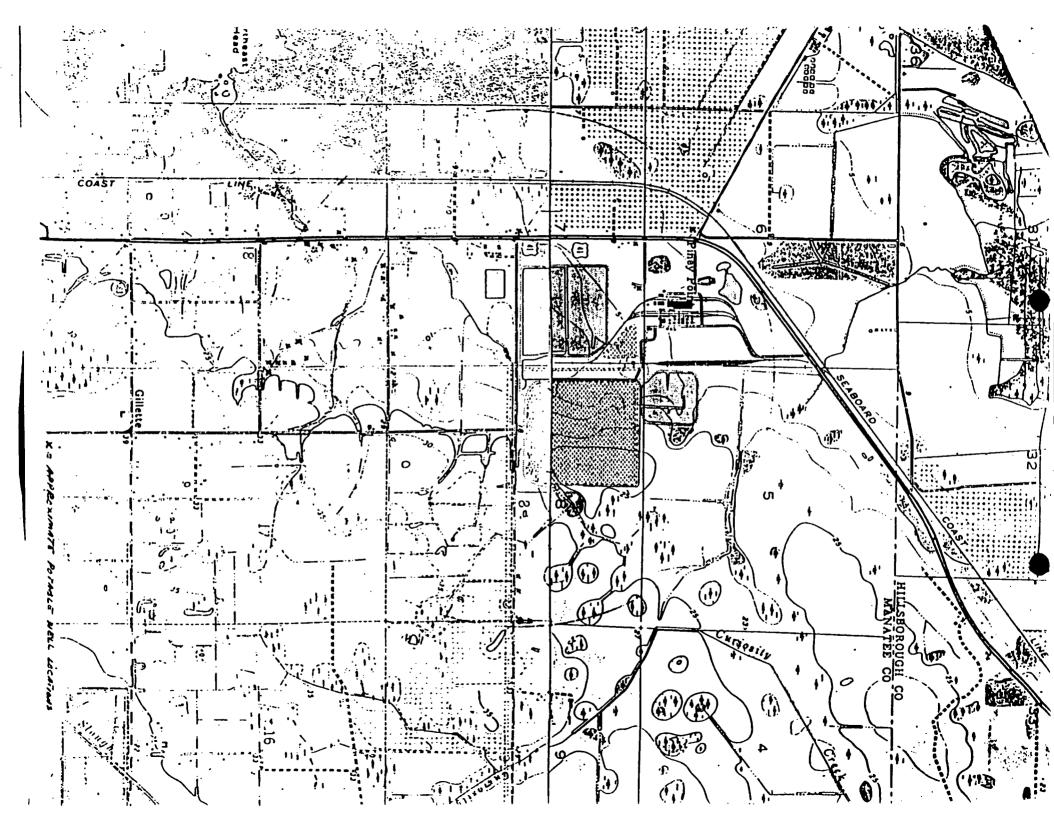
cc: Mr. Peter McGarry, EPA

Mr. William Priesmeyer, Manatee County

Dr. Richard Garrity, D.E.R., Tampa

Mr. Larry Schwartz, D.E.R., Tallahassee

Mr. Bruce V. Galloway, AMAX



PART III - INDUSTRIAL & THE TER TREATMENT DCESS

A.	Ga	n e	r	1

1.	Type of Industry Phosphate Fe	Control of the selection of the selectio	ir
2.	SIC Code		<u> </u>

- J. Raw Materials and Chesicals Used Stok, lfur, Water Anhydrous Ammonia
- 4. Production Rate 2000 tons/day sulfuric acid; 542 tons/day 100% P2057
 750 tons/day DAP tons/day, lbs/day, etc.
- * 5. Normal Operation 24 hours per day/7 days per week/52 weeks per year hts./day, days/week
 - 6. If operation is sessonal, explain Not Applicable
- 8. Describe westewater treatment process and identify treatment units.

 003 The effluent receives two-stage lime treatment for removal of fluorides and phosphates. The alkaline effuent is clarified, ammonia is removed and then acidulated to near neutral pH and discharged.
- C. List sludge or slurry treatment units.

(Not applicable)

 Describe volume, composition and disposal method of sludge. Identify location(s) of ultimate disposal.

The two-stage treatment process generates sludge consisting of calcium fluoride and calcium phosphate. Volume is a function of the need for treatment and discharge of effluent. Sludges are disposed of in the gypsum disposal area.

E. Method(s) and Location(s) of Flow Measurement.

Non-process outfalls 001 and 002, as well as the treated process water outfall 003 have 90 degree v-notch weirs and continuous flow analyzers.

F. Describe practices to be followed to ensure adequate waste treatment during emergencies such as power loss and equipment failures causing shut down of pollution abatement equipment of the proposed/permitted facilities.

Both the two-stage liming process and the acidulation process have malfunction alarms. These alarms are designed to alert plant personnel to malfunctions or failures in the system. Power failure systems will rely on battery backup for power.

G. Laboratory: List tests for which equipment/chemicals are provided, or contract laboratory to perform analysis.

P,F,pH,N, and suspended solids. The parameters are analyzed in accorda with EPA approved methods. When it is necessary to analyze parameters beyond the capability of the on-site laboratory, either a Company lab at OER form 17-1.204(2) another location or a certified commercial laboratory is Effective November 30, 1982

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*Due to economic considerations, this facility was shut down in January, 1985 and has not operated since that time. (12/86)

PART Y - EFFLUENT DISPOSAL

1.	Inc	mediate receiving body of water (RBW):
	a .	Name Buckeye Road Drainage Ditch
	۵.	Type of receiving water: [X] Fresh [] Salt or brackish
		[X] Drainage Ditch [] Landlocked Lake [] Canel [] Lake with Outfall [] Creek [] Tidel Estuary [] River [] Ocean or Gulf [] Other (Specify)
	c.	Classification of receiving water (in accordance with Rule 17-3); Class I
	d.	Minimum 7-day 10 year low flow of the RBW at the discharge point (if appriate): Not Available cfs
		Identify and describe the flow of effluent from the point of discharge to major body of water. A suitably marked map or aerial photograph may be used to be a suitably be used to be used. Discharge flows into Buckeye Road Drainage Ditcharge flows into Buckeye Road Drainage Buckeye Road Drainage Ditcharge flows into Buckeye Road Drainage Buckeye Road Buckeye Road Drainage Buckeye Road Buckeye Road Drainage Buckeye Road Buckeye
2.		westward to southerly flowing railroad drainage
	a .	Olecharge location: which ultimately discharges into Bishop Hart which flows into Tampa Bay.
		77 77 54 220.0 2
		Latitude 27 . 37 , 24 "N Longitude 82 * 31 ' 54 "N
	ъ.	Design configuration and construction materials:
	b.	
	b. c.	Design configuration and construction materials: Effluent discharges from an underground concrete pipe into
		Design configuration and construction materials: Effluent discharges from an underground concrete pipe into rectangular concrete spillway equipped with a 90° V-notch weir
	c.	Design configuration and construction materials: Effluent discharges from an underground concrete pipe into rectangular concrete spillway equipped with a 90° V-notch weir Distance from shore: Not Applicable
	c. d.	Design configuration and construction materials: Effluent discharges from an underground concrete pipe into rectangular concrete spillway equipped with a 90° V-notch weir Distance from shore: Not Applicable Dissater: 90 Degree V-Notch Weir
3.	c. d. e. f.	Design configuration and construction materials: Effluent discharges from an underground concrete pipe into rectangular concrete spillway equipped with a 90° V-notch weir Distance from shore: Not Applicable Disseter: 90 Degree V-Notch Weir Elevation of discharge invert: Not Applicable Receiving water bottom depth at point of discharge: 2" - 20" (Est) you request a mixing zone (refer to Fla. Admin. Code Rule 17-4.244)? If your request a mixing zone (refer to Fla. Admin. Code Rule 17-4.244)? If you request a pollutants?
. ••	c. d. e. f.	Design configuration and construction materials: Effluent discharges from an underground concrete pipe into rectangular concrete spillway equipped with a 90° V-notch weir Distance from shore: Not Applicable Dismeter: 90 Degree V-Notch Weir Elevation of discharge invert: Not Applicable Receiving water bottom depth at point of discharge: 2" - 20" (Est) you request a mixing zone (refer to fla. Admin. Code Rule 17-4.244)? :f you request a mixing zone (refer to fla. Admin. Code Rule 17-4.244)? :f you request circumstances do not dictate the need for a mixing zone Should future operations develop the need for a mixing zone, request will be made at that time.
8. If (c. d. e. f. Do for	Design configuration and construction materials: Effluent discharges from an underground concrete pipe into rectangular concrete spillwaw equipped with a 90° V-notch weir Distance from shore: Not Applicable Diameter: 90 Degree V-Notch Weir Elevation of discharge invert: Not Applicable Receiving water bottom depth at point of discharge: 2" - 20" (Est) you request a mixing zone (refer to fla. Admin. Code Rule 17-4.244)? If what parameters or pollutants? Current circumstances do not dictate the need for a mixing zone Should future operations develop the need for a mixing zone, request will be made at that time. Luent is discharged to groundwater, complete the following: Not Applicable lands:
8. If (c. d. e. f. Do for	Design configuration and construction materials: Effluent discharges from an underground concrete pipe into rectangular concrete spillway equipped with a 90° V-notch weir Distance from shore: Not Applicable Dismeter: 90 Degree V-Notch Weir Elevation of discharge invert: Not Applicable Receiving water bottom depth at point of discharge: 2" - 20" (Est) you request a mixing zone (refer to fla. Admin. Code Rule 17-4.244)? :f you request a mixing zone (refer to fla. Admin. Code Rule 17-4.244)? :f you request circumstances do not dictate the need for a mixing zone Should future operations develop the need for a mixing zone, request will be made at that time.





'United States Department of Agriculture

Soil Conservation Service In Cooperation with University of Florida. Institute of Food and Agricultural Sciences. Agricultural Experiment Stations and Soil Science Department, and Florida Department of Agriculture and Consumer Services

Mai Florida



This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was done prior to November 1952, when the soil survey program was administered by the Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration. The first soil survey of Manatee County was issued in December 1958. In 1980, the soils were recorrelated, and data were revised and updated for this soil survey. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1980. This survey was made cooperatively by the Soil Conservation Service and the University of Florida, Institute of Food and Agricultural Sciences, Agricultural Experiment Stations and Soil Science Department, and the Florida Department of Agriculture and Consumer Services. It is part of the technical assistance furnished to the Manatee River Soil and Water Conservation District. The Manatee County Board of Commissioners contributed financially to this soil survey.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: Many of the soils in Manatee County are used for crop production. The main crops are citrus and tomatoes.

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Issued April 1983

these soils have a spodic horizon. EauGallie, Myakka, Wabasso, and Wauchula soils are poorly drained, and Pomello soils are moderately well drained. Cassia, Pomello, and Zolfo soils have a spodic horizon and are sandy to a depth of 80 inches or more.

Typical pedon of Braden fine sand, in woodland, about 2 miles southwest of Lorraine and three-fourths of a mile south of Florida Highway 70, NW1/4SW1/4 sec. 21, T. 35 S., R. 19 E.

- A1—0 to 4 inches; very dark gray (10YR 3/1) rubbed fine sand; weak fine granular structure; very friable; common fine roots; very strongly acid; clear smooth boundary.
- A21—4 to 6 inches; grayish brown (10YR 5/2) fine sand; single grained; loose; common fine roots; very strongly acid; clear wavy boundary.
- A22—6 to 10 inches; brown (10YR 5/3) fine sand; single grained; loose; few fine roots; very strongly acid; clear wavy boundary.
- A23—10 to 18 inches; dark brown (10YR 4/3) fine sand; single grained; loose; few fine roots; strongly acid; clear wavy boundary.
- A24—18 to 24 inches; light yellowish brown (10YR 6/4) fine sand; common fine faint very pale brown mottles; single grained; loose; very strongly acid; gradual wavy boundary.
- B1—24 to 28 inches; yellow (10YR 7/6) fine sand; common fine distinct strong brown (7.5YR 5/6) segregated iron mottles; single grained; loose; very strongly acid; clear wavy boundary.
- B21t—28 to 36 inches; yellowish brown (10YR 5/8) fine sandy loam; common fine and medium distinct light gray (10YR 7/1; 7/2) and common fine faint strong brown and yellowish red mottles; weak coarse subangular blocky structure; friable; sand grains bridged and coated with clay; extremely acid; gradual wavy boundary.
- B22t—36 to 40 inches; yellowish brown (10YR 5/8) fine sandy loam; many medium distinct light gray (10YR 7/2) and common fine faint strong brown and yellowish red mottles; weak coarse subangular blocky structure; friable; sand grains coated and bridged with clay; few thin lenses of loamy fine sand; extremely acid; gradual wavy boundary.
- B3—40 to 44 inches; very pale brown (10YR 7/4) loamy fine sand; many medium distinct light gray (10YR 7/2) and many fine faint strong brown mottles; moderate medium granular structure; very friable; extremely acid; clear wavy boundary.
- C1g—44 to 50 inches; light gray (10YR 7/2) fine sand; few fine distinct brownish yellow (10YR 6/8) mottles; single grained; loose; extremely acid; gradual wavy boundary.
- C2g—50 to 55 inches; light brownish gray (10YR 6/2) fine sand; few medium faint light gray (10YR 7/2) mottles; single grained; loose; clear wavy boundary.

C3g—55 to 70 inches; gray (10YR 5/1) sand; many coarse distinct light gray (10YR 7/2) mottles; single grained; loose; very strongly acid.

The solum ranges from 40 to 60 inches in thickness. The A horizon is very strongly acid or strongly acid. The Bt and C horizons range from extremely acid to strongly acid.

The A1, or Ap, horizon has hue of 10YR, value of 2, and chroma of 1 or value of 3 or 4 and chroma of 1 to 3. It is less than 10 inches thick where value is 3 or less and chroma is 2 or 1.

The A21 horizon has hue of 10YR, value of 5 to 7, and chroma of 2. The A22 to A24 horizons have hue of 10YR, value of 5 or 6, and chroma of 3 to 6; or value of 4 and chroma of 3 or 4; or value of 7 and chroma of 3 or 4. In some pedons there are few to common mottles or splotches of uncoated sand grains that have chroma of 2 or 1. The A horizon is sand or fine sand. There is no A21 horizon in some pedons.

The B1 horizon has hue of 10YR or 7.5YR, value of 5 to 7, and chroma of 4 to 8. It is sand, fine sand, loamy sand, or loamy fine sand. There is no B1 horizon in some pedons.

The B2t horizon has hue of 10YR, value of 5 to 7, and chroma of 3 to 8; or hue of 7.5YR, value of 5, and chroma of 4 or 6; or value of 6 and chroma of 4 to 8 and few to many mottles that have chroma of 2 or less. There are mottles of higher value and chroma in many pedons. The horizon is sandy loam, fine sandy loam, or sandy clay loam. In some pedons there are a few streaks or lenses of coarser textured material. The mottles that have chroma of 2 are at a depth of less than 30 inches. They indicate wetness.

In some pedons the lower part of the B2t horizon has hue of 10YR, value of 4 to 7, and chroma of 2 or 1; or hue of 2.5Y, value of 4 to 7, and chroma of 2; or hue of 5Y, value of 5 or 6, and chroma of 1; or it has no hue (N), value is 4 to 7, and in some pedons, there are mottles of red, yellow, brown, or gray. The texture is sandy loam, fine sandy loam, or sandy clay loam.

The B3 horizon has hue, value, and chroma that are similar to those of the B2t horizon. It ranges from fine sandy loam to loamy sand. There is no B3 horizon in some pedons.

The Cg horizon has hue, value, and chroma similar to those of the lower part of the B2t horizon. It is sand or fine sand.

Bradenton series

The Bradenton series consists of poorly drained, moderately permeable soils that formed in unconsolidated loamy marine sediment underlain by marl and, in some places, hard limestone. The soils are nearly level and are on low-lying ridges and hammocks. Slopes are generally smooth and are less than 2 percent. In most years, if the soils are not drained, the water table is

- B22tca—24 to 44 inches: very dark gray (10YR 3/1) sandy clay loam; weak coarse subangular blocky structure: friable; sticky and plastic; few fine roots: many soft white calcium carbonate accumulations; sand grains coated and bridged with clay; moderately alkaline, calcareous; gradual wavy boundary.
- B23tca—44 to 51 inches: dark gray (10YR 4/1) sandy clay loam; few fine distinct yellowish brown (10YR 5/4) and strong brown (7.5YR 5/8) mottles; weak coarse subangular blocky structure; friable; sticky and plastic; sand grains coated and bridged with clay; many fine and medium white calcium carbonate accumulations; moderately alkaline, calcareous; gradual wavy boundary.
- B3g—51 to 63 inches: gray (10YR 5/1) fine sandy loam: common medium distinct yellowish brown (10YR 5/4) mottles: massive: friable: common calcium carbonate nodules: moderately alkaline, calcareous; gradual wavy boundary.
- Cg—63 to 80 inches: gray (10YR 6/1) loamy fine sand and fine sand: massive: very friable; few small calcium carbonate nodules; moderately alkaline, calcareous.

The solum is more than 40 inches thick.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. Reaction ranges from slightly acid to moderately alkaline. Thickness ranges from 4 to 18 inches.

The B2t and B2tca horizons have no hue (N) or have nue of 10YR; value is 2 through 5, and chroma is 1 or 0; or they have hue of 5YR, value of 4 through 6, and chroma of 1 or 2 and, in some pedons, mottles of gray or brown; or they have hue of 2.5Y, value of 4 or 5, and 1.0 Ma of 2 and mottles. Texture is sandy loam or sandy clay loam. Clay content in the upper 20 inches of the arcillic horizon ranges from 18 to 35 percent. In the Btca horizon, reaction ranges from neutral to moderately alkaline and calcareous.

The B3g horizon has the same color range as the B2t and B2tca horizons. Its texture is sandy loam or fine sand loam. The horizon has pockets or lenses of coarser material in some places.

The Cg horizon has nue of 10YR, value of 5 through Thing proma of things of 2.5Y, value of 5 through Than chroma of 2; hue of 5Y, value of 5 through 7, and chroma of 1 or 2; or hue of 5GY, value of 5 or 6, and chroma of 1 and, in some pedons, mottles. Its texture ranges from fine sand or loamy fine sand to clay loam. Reaction ranges from neutral to moderately alkaline and laborateus. Here are steel tragments in some pedons.

Chobee Variant

Chobee Variant soils are very poorly drained, slowly permeable soils that formed in thick ceds of alkaline

loamy marine sediment. These soils are nearly level and are in shallow depressions mainly in the western part of the county. The water table is at a depth of less than 10 inches for 6 months or more of the year. Undrained areas pond for long periods. Slopes range from 0 to 2 percent. These soils are fine-loamy, carbonatic, hyperthermic Typic Haplaquolls.

Chobee Variant soils are near Bradenton. Chobee. Felda, and Manatee soils. Bradenton soils do not have a mollic epipedon and are poorly drained. Chobee soils have an argillic horizon. Felda soils are poorly drained and have an argillic horizon below a depth of 20 inches. Manatee soils have a sandy loam argillic horizon.

Typical profile of Chobee Variant sandy clay loam, in a wooded area, 100 feet east of Cedar Drain and one-haif mile south of Atlantic Coast Line Railroad, SE1/4NE1.4 sec. 28, T. 33 S., R. 18 E.

- A11—0 to 13 inches; black (10YR 2/1) sandy clay loam, weak medium subangular blocky structure; firm; high in organic matter; few fine and medium roots; neutral; clear wavy boundary.
- A12—13 to 20 inches: very dark gray (10YR 3/1) sandy clay loam; weak medium subangular blocky structure; common fine faint very dark grayish brown mottles; firm; few fine and medium roots; neutral; clear wavy boundary.
- B2gca—20 to 35 inches; light gray (10YR 7/2) sandy clay loam; common fine distinct dark gray (10YR 4/1) mottles; moderate medium subangular blocky structure; sticky; soft accumulations of calcium carbonate; moderately alkaline, calcareous; clear wavy boundary.
- B3gca—35 to 40 inches; light gray sandy loam; common medium distinct yellow (10YR 7/6) mottles; weak fine subangular blocky structure; slightly sticky: safe accumulations of calcium carbonate; moderately alkaline, calcareous; clear wavy boundary.
- C1g—40 to 70 inches; light gray (10YR 7-2) leamy sand weak medium granular structure; few fine shell fragments; very friable; moderately alkaline, calcareous; clear wavy boundary.
- C2g—70 to 80 inches; mixed tight gray (10YR 7/2) and brownish yellow (10YR 6/6) sand; single grained; loose; common shell fragments; moderately alkaine calcareous.

The solum ranges from 35 to 60 inches in thickness Base saturation is 50 percent or more in all horizons. The mollic epipedon is 10 to 24 inches thick.

The A horizon has no hue (N) or has hue of 10YR: aug a 1 or 1 and erroma is 1 or 1 Feature rand from medium acid to neutral.

The Bgca horizon has no hue (N) or has hue of 10YF value is 5 to 7, and chroma is 2 to 0. The texture is mainly sandy clay loam or sandy clay but ranges to sandy loam in the lower part. The content of clay in the

10- to 40-inch control section averages 20 to 35 percent. Reaction is mildly alkaline or moderately alkaline. There are few to common mottles in shades of yellow or brown.

The Cg horizon has no hue (N) or has hue of 10YR; value is 5 to 7, and chroma is 2 to 0. The texture is sand or loamy sand. Carbonatic accumulations are common in some pedons. Shell fragments range from few to common.

Delray series

The Delray series consists of very poorly drained soils that formed in marine sandy and loamy material. Permeability is moderate or moderately rapid. The soils are nearly level and are in low shallow depressions. In most years, if the soils are not drained, the water table is at or slightly above the surface for more than 6 months of the year. Slopes are less than 2 percent. These soils are loamy, mixed, hyperthermic Grossarenic Argiaquolls.

Delray soils are near Bradenton, Felda, Floridana, EauGallie, Manatee, Myakka, Ona, Pomona, and Waveland soils. Bradenton soils do not have a mollic epipedon but have an argillic horizon at a depth of less than 20 inches. Felda soils do not have a mollic epipedon but have an argillic horizon at a depth between 20 and 40 inches. Floridana soils have an argillic horizon at a depth between 20 and 40 inches. Manatee soils have an argillic horizon at a depth of less than 20 inches. EauGallie, Myakka, Ona, Pomona, and Waveland soils have a spodic horizon and are better drained than Delray soils.

Typical pedon of Delray mucky loamy fine sand, in a wooded area, about 2.5 miles east of the Sarasota County line and 0.75 mile south of Florida Highway 18, NW1/4NE1/4 sec. 16, T. 37 S., R. 21 E.

- A11—0 to 8 inches; black (N 2/0) mucky loamy fine sand; weak medium granular structure; very friable; common fine and medium roots; neutral; gradual smooth boundary.
- A12—8 to 16 inches; black (10YR 2/1) loamy fine sand; few fine faint dark gray mottles; weak medium granular structure; very fnable; many fine roots; neutral; clear wavy boundary.
- A21—16 to 21 inches; grayish brown (10YR 5/2) fine sand; common medium distinct very dark gray (10YR 3/1) streaks and mottles; single grained; loose; common fine and few medium roots; neutral; clear wavy boundary.
- A22—21 to 43 inches; light brownish gray (10YR 6/2) fine sand; common medium distinct dark gray (10YR 4/1) mottles and very dark gray (10YR 3/1) streaks along old root channels; single grained; loose; common fine and few medium roots; neutral; clear wavy boundary.

- A23—43 to 48 inches; grayish brown (10YR 5/2) fine sand; single grained; loose; few fine roots; neutral; clear wavy boundary.
- B21tg—48 to 51 inches; grayish brown (2.5Y 5/2) fine sandy loam; weak medium subangular blocky structure; friable; sand grains coated and bridged with clay; few fine roots; mildly alkaline; clear wavy boundary.
- B22tg—51 to 66 inches; grayish brown (2.5Y 5/2) sandy clay loam; few fine distinct yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; firm; few clay films on ped surfaces; neutral; gradual wavy boundary.
- B23tg—66 to 75 inches; greenish gray (5GY 6/1) sandy clay loam; common medium distinct olive brown (2.5Y 4/4) mottles; moderate medium subangular blocky structure; firm; clay films on ped surfaces; neutral; clear wavy boundary.
- B24tg—75 to 80 inches; grayish brown (2.5Y 5/2) sandy clay loam; few fine faint light gray mottles; weak medium subangular blocky structure; firm; few clay films on ped surfaces; common fine sand lenses between peds; neutral.

Reaction ranges from medium acid to neutral in the A horizon and from neutral to mildly alkaline in the Btg horizon.

The A1 horizon has hue of 10YR, value of 3 or less, and chroma of 2 or 1; or it has no hue (N) and value of 2 or 3. The content of organic matter ranges from about 2 to 18 percent. The horizon ranges from 10 to 24 inches in thickness.

The A2 horizon has hue of 10YR or 2.5YR, value of 4 to 7, and chroma of 2; or it has hue of 10YR, value of 4 to 7, and chroma of 1; or it has no hue (N) and value of 4 to 7. The texture is fine sand or sand. The horizon ranges from 27 to 55 inches in thickness.

The B2tg horizon has hue of 10YR to 5GY, value of 4 to 6, and chroma of 1; or hue of 10YR, value of 4 to 6, and chroma of 2; or it has no hue (N), and value is 4 to 6. It has mottles of brown, yellow, or olive in some pedons. Its texture is fine sandy loam or sandy clay loam.

The B3g horizon is similar in color to the B2tg horizon. Its texture is loamy sand or loamy fine sand. There is no B3g horizon in some pedons.

Duette series

The Duette series consists of moderately well drained soils that formed in thick deposits of marine sand. Permeability is moderately rapid. The soils are nearly level to gently sloping and are on low ridges and knolls in flatwoods. In most years, if the soils are not drained, the water table is at a depth of 48 to 72 inches for 1 to 4 months during the wet season. It is at a depth of more than 72 inches for the rest of the year. Slopes range

within 10 inches of the surface for 2 to 6 months out of the year and at a depth of 10 to 40 inches for much of the rest of the year. In dry periods the water table recedes to a depth below 40 inches. These soils are coarse-ioamy, siliceous, hyperthermic Typic Ochraqualfs.

Bradenton soils are near Chobee, Delray, EauGallie, Felda, Floridana, Manatee, Wabasso, and Waveland soils. Chobee soils are fine-loamy. Delray and Floridana soils have a mollic epipedon and an A horizon that is more than 20 inches thick. EauGallie, Wabasso, and Waveland soils have a spodic horizon. Felda soils have an A horizon that is 20 to 40 inches thick. Manatee soils have a mollic epipedon.

Typical pedon of Bradenton fine sand, in a hardwood-cabbage palm hammock, about one-eighth mile east of the Sarasota County line along the north boundary of the Myakka River State Park, SW1/4NW1/4 sec. 6, T. 37 S., R. 21 E.

- A1—0 to 4 inches; dark gray (10YR 4/1) fine sand; moderate medium granular structure; very friable; many fine and medium roots; medium acid; clear smooth boundary.
- A2—4 to 9 inches; grayish brown (10YR 5/2) fine sand; few medium distinct dark gray (10YR 4/1) mottles; single grained; loose; many fine and medium roots; medium acid; abrupt wavy boundary.
- B21tg—9 to 20 inches; dark gray (10YR 4/1) fine sandy loam; common fine and medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; common fine and medium roots; few thin discontinuous clay films on surface of peds; slightly acid; gradual wavy boundary.
- B22tg—20 to 27 inches: gray (10YR 5/1) fine sandy loam; many fine distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable: few thin discontinuous clay films on surface of peds; common soft white calcium carbonate accumulations; mildly alkaline; gradual wavy boundary.
- B3g—27 to 38 inches; gray (10YR 5/1) loamy fine sand; weak coarse subangular blocky structure; very friable; many sand grains coated with white calcium carbonate, few white calcium carbonate nodules; mildly attaine, calcareous; clear wayy boundary
- C—38 to 80 inches; light gray (10YR 7/1) marl that has texture of loamy fine sand; massive; friable; moderately alkaline, calcareous.

The solum ranges from 20 to 50 inches in thickness. The A1, or Ap, norizon has hue of 10YR, value of 2 to 4, and chroma of 1; or it has no hue (N) and value of 2 to 4. It ranges from medium acid to neutral and ranges from 4 to 6 inches in thickness.

The A2 horizon has hue of 10YR, value of 4 to 7, and chroma of 1; or value of 5 to 7 and chroma of 2; or it

has no hue (N) and value of 4 to 7 and mottles of gray, brown, or yellow. Reaction ranges from medium acid to neutral. The total thickness of the A horizon is less than 20 inches.

The B2tg horizon has hue of 10YR, value of 4 to 7, and chroma of 1; or hue of 10YR or 2.5Y, value of 3 to 7, and chroma of 2; or it has no hue (N) and value of 4 to 7 and, in places, mottles of brown, yellow, or red. The horizon is sandy loam or fine sandy loam, and it ranges from slightly acid to mildly alkaline. In many pedons the lower part of the horizon has soft calcium carbonate accumulations and nodules. The B3g horizon is similar in color to the B2tg horizon. It is loamy sand or loamy fine sand and is mildly alkaline or moderately alkaline. In some places there is no B3g horizon.

The C horizon has hue of 10YR to 5GY, value of 5 to 8, and chroma of 2 or 1. It is predominantly mart that has texture of loamy sand or loamy fine sand. However, in some pedons the C horizon is a mixture of shells, shell fragments, and sand.

In some pedons a layer of limestone about 1.5 to 3 feet thick underlies the Btg. B3g, or C horizons at a depth between 40 and 80 inches. The limestone can be dug with a backhoe. It has few to common solution holes or fractures. Below the limestone there is variable sand to sandy clay loam mixed with shells and shell fragments.

Broward Variant

Broward Variant soils are poorly drained and moderately permeable. They formed in sandy marine sediment overlying limestone. These soils are nearly level and are in moderately large to small areas of flatwoods, mainly in the western part of the county. Slopes are 0 to 2 percent. In most years, if the soils are not drained, the water table is between depths of 10 and 40 inches for more than 6 months of the year. It is at a depth of less than 10 inches for 1 to 4 months in wet seasons and recedes to a depth below 40 inches in very dry seasons. These soils are sandy, siliceous, hyperthermic Entic Haplaguods.

Broward Variant soils are near Chobee. Delray, EauGallie, Myakka, and Wabasso Variant soils. All the associated soils except Wabasso Variant soils do not have limestone within a depth of 80 inches. Chobee and Delray soils have a mollic epipedon, do not have a spodic horizon, and have an argillic horizon. EauGallie soils have an argillic horizon below a depth of 40 inches. Myakka soils have a spodic horizon that is better developed than that of Broward Variant soils. Wabasso Variant soils have an argillic norizon between the special horizon and limestone.

Typical pedon of Broward Variant fine sand, in a partly cleared area, about 2 miles west of Oneco and about 1,000 feet north of 53rd Ave., SW1/4SW1/4 sec. 11. T. 35 S., R. 17 E.

from 0 to 5 percent. These soils are sandy, siliceous, hyperthermic Grossarenic Entic Haplohumods.

Duette soils are near Cassia. Myakka. and Pomello soils. Cassia and Myakka soils have a spodic horizon at a depth of less than 30 inches. Cassia soils are somewhat poorly drained, and Myakka soils are poorly drained. Pomello soils have a spodic horizon at a depth between 30 and 50 inches.

Typical pedon of Duette fine sand. 0 to 5 percent slopes, in an area of sand scrub, approximately 2.25 miles east of the northeast corner of the Myakka River State Park, SW1/4SW1/4SW1/4 sec. 3, T. 37 S., R. 21 F.

- A1—0 to 4 inches; very dark gray (10YR 3/1) rubbed, salt and pepper appearance unrubbed, fine sand; weak fine granular structure; friable; many fine and medium roots; strongly acid; clear smooth boundary.
- A21—4 to 12 inches; light gray (10YR 7/2) fine sand; single grained; loose; few fine and coarse roots; slightly acid; clear smooth boundary.
- A22—12 to 58 inches: white (10YR 8/1) fine sand; single grained: loose: few fine and coarse roots: slightly acid: clear smooth boundary.
- B21h—58 to 64 inches: dark brown (7.5YR 3/2) fine sand; weak medium subangular blocky structure; friable; sand grains well coated with organic matter; few fine roots; strongly acid; clear wavy boundary.
- B22h—64 to 80 inches: black (5YR 2/1) fine sand; weak medium subangular blocky structure; friable: many fine and medium roots; strongly acid.

Reaction ranges from slightly acid to strongly acid throughout. Texture is sand or fine sand in all horizons.

The A1 horizon has hue of 10YR, value of 3 to 5, and throma of 1 or 2. Unrubbed material has a sait and pepper appearance. To okness ranges from 2 to 6 inches.

The A2 norizon has hue of 10YR, value of 6 to 8, and chroma of 1 or 2. Combined thickness of the A1 and A2 norizons ranges from 51 to 75 inches.

The Bh horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2; or hue of 7.5YR, value of 3, and chroma of 2; or hue of 5YR, value of 2 or 3, and chroma of 1 to 4

TauGallio corice

The EauGallie series consists of poorly drained soils that formed in thick beds of sandy and loamy marine sediment. Permeability is moderate to moderately rapid. The soils are nearly level and are in broad areas of aiwcous and, it some places, in slightly addressed areas. In most years, a water table is at a depth of less than 10 nones for 2 to 4 months in wet seasons and at a depth of less than 40 inches for more than 6 months of the year. Slopes range from 0 to 2 percent. These soils are sandy, siliceous, hyperthermic Alfic Habiaguods.

EauGallie soils are near Delray, Pinellas, and Wabasso soils. Delray soils are very poorly drained, have a mollic epipedon, and do not have a spodic horizon. Pinellas soils do not have a spodic horizon. Wabasso soils have an argillic horizon at a lesser depth.

Typical pedon of EauGallie fine sand, in a pasture, about 2.5 miles west of Foxleigh and 3.25 miles southeast of the Manatee River, SW1/4NE1/4 sec. 26, T. 34 S., R. 18 E.

- Ap—0 to 5 inches; very dark gray (10YR 3/1) fine sand: weak fine granular structure; very friable; many fine roots; mixture of light gray sand grains and black organic matter granules; very strongly acid; gradual wavy boundary.
- A21—5 to 12 inches; grayish brown (10YR 5/2) fine sand; single grained; loose; few fine roots; very strongly acid; gradual wavy boundary.
- A22—12 to 28 inches; light brownish gray (10YR 6/2) fine sand; single grained: loose; few fine roots; few medium distinct grayish brown (10YR 5/2) mottles; very strongly acid; abrupt wavy boundary.
- 92h—28 to 42 inches: black (5YR 2/1) fine sand: massive in place, crushes to moderate medium granular structure; friable sand grains coated with organic matter; few fine roots; very strongly acid: clear wavy boundary.
- B2tg—42 to 50 inches; grayish brown (2.5Y 5/2) sandy clay loam; moderate medium subangular blocky structure; firm and slightly sticky; few fine roots; sand grains coated and bridged with clay; slightly acid; gradual wavy boundary.
- C—50 to 65 inches; mixed lenses and pockets of grayish brown (10YR 5/2) fine sand, loamy fine sand, and fine sandy loam; massive; friable; few pockets of grayish prown (2.5Y 5. 2) sandy clay loam; slightly acid.

The solum is more than 46 inches thick. The A horizon is less than 30 inches thick. The Big horizon is at a depth of more than 40 inches. The A and Bh horizons are sand or fine sand.

The A1 horizon has hue of 10YR, value of 2 to 4, and chroma of 1. It ranges from 3 to 9 inches in thickness. The A2 horizon has hue of 10YR, value of 5 to 8, and chroma of 2 or 1. The A horizon is very strongly or strongly acid.

The B2h horizon has no hue (N) and value of 2: or hue of 10YR or 5YR, value of 2, and chroma of 1 or 2: or hue of 5YR and 7.5YR, value of 3, and chroma of 2: or hue of 5YR, value of 3, and chroma of 3. The sand grains are scaled with organic matter. Reaction ranges from very strongly acid to slightly acid. The B3 horizon has hue of 10YR, value of 3 to 6, and chroma of 3. It consists of sand or fine sand. It is commonly below the Bh horizon. The A'2 horizon has hue of 10YR, value of 4 or 5, and chroma of 1: or hue of 10YR or 2.5Y, value of

5 or 6, and chroma of 2. There is no A'2 horizon in some pedons.

The B2tg horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 or 1. In some pedons it has mottles in shades of brown, yellow, or gray. Its texture is sandy loam or sandy clay loam. There are pockets or sand or loamy sand. Reaction is medium acid to mildly alkaline.

The C horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 or 1. In some pedons it has mottles in shades of yellow or brown, its texture is fine sand, loamy fine sand, or sandy loam. The horizon has pockets of finer textured material in some pedons. Reaction is slightly acid to mildy alkaline.

Estero series

The Estero series consists of very poorly drained soils that formed in thick deposits of sandy marine sediment under conditions favorable for the accumulation of organic material. Permeability is moderately rapid. These soils are nearly level and are in tidal mangrove swamps. Slopes are less than 1 percent. These soils are flooded daily by nightides. The water table is above the surface or just below the surface, depending on the tide. These soils are sandy, siliceous, hypertnermic Typic Haplaguods.

Estero soils are near Wulfert and Kesson soils in tidal swamps and Myakka, Delray, Bradenton, and St. Johns soils on uplands. Wulfert soils are organic. Kesson soils do not have a spodic norizon. Myakka, Delray, Bradenton, and St. Johns soils do not have a histic epipedon. Delray soils have a mollic epipedon, do not have a spodic horizon, and have an argillic horizon. Eradenton soils do not have a spodic horizon but have an argillic horizon, st. Johns soils have an umbric epipedon.

Tudical description Esterol nuck, in a mangrove swamp, on Perico Island, SW1/4SE1/4 sec. 27, R. 16 E., T. 34 S.

- Ca—0 to 6 inches: black (10YR 2/1) muck; about 90 percent fiber, less than 10 percent rubbed; massive; friable; neutral; abrupt smooth boundary.
- Ant—B to 11 inches; black (N 2/0) fine sand; weak fine moderately alkaline; clear smooth boundary.
- A12—11 to 14 inches: very dark gray (10YR 3/1) fine sand: weak fine granular structure; very friable; many fine roots: moderately alkaline; clear wavy
- =21—14 to 20 inches; light brownish gray (10YR 6/2) fine sand; few fine distinct yellowish red (5YR 5/3) mottles; single grained; loose; few fine roots; moderately alkaline; clear wavy boundary.

- A22—20 to 31 inches; grayish brown (10YR 5/2) fine sand; few medium distinct yellowish red (5YR 5/6) mottles; single grained; loose; few very fine roots; mildly alkaline; abrupt wavy boundary.
- B21h—31 to 41 inches: black (5YR 2/1) and dark grayish brown (10YR 4/2) fine sand: massive, very friable; sand grains thinly coated with organic matter; very strongly acid; clear wavy boundary.
- B22h—41 to 46 inches; black (10YR 2/1) and dark reddish brown (5YR 3/2) fine sand; massive; very friable; sand grains thinly coated with organic matter; very strongly acid; gradual wavy boundary.
- B3—46 to 56 inches; dark brown (10YR 4/3) and black (10YR 2/1) fine sand; massive: very friable; very strengly acid: clear wavy boundary.
- C—56 to 80 inches: grayish brown (10YR 5/2) fine sand: few fine distinct black (10YR 2/1) mottles; single grained; loose; very strongly acid.

Reaction in the Oa and A horizons ranges from neutral to moderately alkaline by field test and from very strongly acid to mildly alkaline after drying. The Bh horizon is strongly acid or very strongly acid. Conductivity of the saturation extract ranges from about 245 to 350 mmho/cm in the Oa horizon and from 15 to 45 mmho/cm in the mineral horizons.

The Oa or Oe horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. In pedons where the Oa or Oe horizon is less than 10 inches thick, there is a histic epipedon if the soil is mixed to a depth of 10 inches.

The A1 horizon has hue of 10YR, value of 2, and chroma of 1, or value of 3 or 4 and chroma of 1 or 2; or hue of 2.5Y, value of 3 or 4, and chroma of 2; or it has no hue (N), and value is 2 to 4. Where value is 3 or less and chroma is 2 or 1, it is less than 10 inches thick even after mixing with the Oa or Oe norizon to a depth of 1, inches. The texture is sand, fine sand, mucky sand, or mucky fine sand.

The A2 horizon has hue of 10YR, value of 5 to 7, and chroma of 1 or 2 and, in some pedons, has brown, yellow, red, or gray mottles and streaks, its texture is sand or fine sand.

The Bin horizon has hue of 10YR, value of 2, and chroma of 1; or value of 3 and chroma of 1 or 2; or hue of 7.5YR, value of 3, and chroma of 2; or hue of 5YR, value of 3. and chroma of 2; or hue of 5YR, value 2. 2 and 1 or 10 and 1 or

The B3 horizon has nue of 10YR, value of 3, and chroma of 3; or value of 4 and chroma of 2 to 4; or nue of 7.5YR and 5YR, value of 4, and chroma of 2 or 4. Its texture is sand or fine sand.

but in places extends throughout the horizon as small bodies of uncemented fine sand. The B&Bh horizon is 18 to 43 inches thick.

The C horizon has hue of 10YR, value of 6 to 8, and chroma of 1 to 4. It extends to a depth of 80 inches or more.

Palmetto series

The Palmetto series consists of deep, poorly drained soils that formed in thick deposits of sand and loamy marine sediment. Permeability is moderately slow. The soils are nearly level. They are in the flatwoods in sloughs, in poorly defined drainageways, and in depressions. Slopes are less than 2 percent. In most years, if the soils are not drained, the water table is at a depth of 10 inches for 2 to 6 months of the year. In depressions water is ponded for 2 to 6 months of the year. These soils are loamy, siliceous, hyperthermic Grossarenic Paleaguults.

Palmetto soils are near Delray, EauGallie, Wabasso, and Waveland soils. Delray soils have a mollic epipedon and are sandy to a depth of 80 inches or more. EauGallie, Wabasso, and Waveland soils have a spodic horizon. A part of the spodic horizon in Waveland soils is ortstein.

Typical pedon of Palmetto sand, about 2.25 miles north of Verna, SW1/4SW1/4 sec. 24, T. 35 S., R. 20 E.

- A11—0 to 8 inches; black (10YR 2/1) sand; moderate medium granular structure; very friable; many fine roots; extremely acid; clear wavy boundary.
- A12—8 to 10 inches; dark gray (10YR 4/1) sand; common medium distinct gray (10YR 5/1) mottles; single grained; loose; common fine roots; extremely acid; gradual wavy boundary.
- A2—10 to 25 inches; gray (10YR 6/1) sand; common medium distinct gray (10YR 5/1) and light gray (10YR 7/1) mottles; single grained; loose; few fine roots; extremely acid; clear wavy boundary.
- Bh&A2—25 to 30 inches; dark grayish brown (10YR 4/2) sand; many coarse distinct gray (10YR 5/1) mottles consisting of material from the A2 horizon and common medium distinct very dark grayish brown (10YR 3/2) Bh fragments; single grained; loose; many uncoated sand grains; extremely acid; gradual wavy boundary.
- B21h—30 to 40 inches; dark grayish brown (10YR 4/2) sand; common medium faint very dark grayish brown (10YR 3/2) mottles; single grained; loose; many uncoated sand grains; extremely acid; gradual wavy boundary.
- B22h—40 to 45 inches: very dark grayish brown (10YR 3/2) sand; common coarse faint dark grayish brown (10YR 4/2) mottles; single grained; loose; many uncoated sand grains; extremely acid; clear wavy boundary.

- B21tg—45 to 60 inches; grayish brown (2.5Y 5/2) sandy clay loam; few medium distinct yellowish brown (10YR 5/6) and few coarse faint dark grayish brown mottles; weak coarse subangular blocky structure: friable; sand grains moderately coated and bridged with clay; very strongly acid; gradual wavy boundary.
- B22tg—60 to 64 inches; dark grayish brown (2.5Y 4/2) sandy loam; common coarse faint grayish brown (2.5Y 5/2) mottles; weak coarse subangular blocky structure; friable; sand grains moderately coated and bridged with clay; very strongly acid; gradual wavy boundary.
- B3g—64 to 68 inches; dark grayish brown (2.5Y 4/2) loamy sand; massive; friable; very strongly acid.

The B'2tg horizon is at a depth of more than 40 inches. The A and Bh horizons are extremely acid to strongly acid. The B2t, B3g, and Cg horizons are very strongly acid or strongly acid.

The A1, or Ap, horizon has hue of 10YR, value of 1 to 4, and chroma of 2 or 1; or it has no hue (N), and value is 1 to 4. It is as much as 8 inches thick where value is 2 or 3. Its texture is sand or fine sand.

The A2 horizon has no hue (N) or has hue of 10YR or 2.5Y; value is 5 to 7, chroma is 2 to 0, and there are mottles in some pedons; or value is 5, chroma is 2, and there are mottles. Its texture is sand or fine sand.

The Bh&A2 horizon has the same colors as those of the component horizons. There is no Bh&A2 horizon in some pedons.

The B2h horizon does not meet the requirements of a spodic horizon. It mainly has hue of 10YR, value of 3, and chroma of 2 or 3 or value of 4 and chroma of 2 to 4; or hue of 7.5YR, value of 4, and chroma of 2 or 4; but it ranges to hue of 10YR, value of 5, and chroma of 2 to 4 where the A2 horizon has value of 7. Uncoated sand grains in the B2h horizon are common to many. The horizon is sand or fine sand.

The A'2 horizon has hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 3 or less. Its texture is sand or fine sand. There is no A'2 horizon in some pedans.

The B2tg or B'2tg horizon has hue of 10YR or 5Y, value of 4 to 7, and chroma of 1 or 2; or hue of 2.5Y, value of 4 to 7, and chroma of 1 or 2; or hue of 2.5Y, value of 4 to 7, and chroma of 2; or it has no hue (N) and value of 4 to 7, and, in some pedons, mottles of yellow, brown, red, or gray. The control section is sandy loam or sandy clay loam. In some pedons the lower B2tg horizon is sandy clay.

The B3 or B'3g horizon has the same color range as that of the B2tg horizon. It ranges from loamy sand to fine sandy loam.

The Cg horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 to 8, and chroma of 4 or less. It ranges from sand to loamy fine sand. There is no Cg horizon in some pedons.

yellow mottles in lower 2 inches of horizon; weak medium granular structure; loose; common fine and coarse roots; few fine scattered carbon particles; dark brown staining along root channels; strongly acid; gradual wavy boundary.

- C3—34 to 56 inches; yellowish brown (10YR 5/6) fine sand; weak medium granular structure; loose; few coarse roots; few fine faint gray splotches; sand grains lightly coated; very strongly acid; gradual wavy boundary.
- C4—56 to 76 inches; very pale brown (10YR 7/3) fine sand; common fine and medium distinct strong brown (7.5YR 5/6) mottles; weak medium granular structure; loose; few coarse roots; many uncoated sand grains; strongly acid; gradual wavy boundary.
- C5—76 to 86 inches; white (10YR 8/1) fine sand; few fine faint yellowish brown and very pale brown mottles; single grained; loose; few coarse roots; strongly acid.

These soils are fine sand to a depth of 80 inches or more. Reaction ranges from very strongly acid to medium acid in all horizons. The content of silt and clay in the 10- to 40-inch control section is less than 5 percent.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 1 or 2 or value of 5 and chroma of 1; or hue of 2.5Y, value of 3 or 4, and chroma of 2. It is 3 to 8 inches thick.

The C horizon in the upper part has hue of 10YR, value of 6 or 7, and chroma of 3 or 4 or value of 5 and chroma of 2 to 8. In the lower part it has hue of 10YR, value of 6, and chroma of 1 to 3 or value of 7 and chroma of 1 to 4 or value of 8 and chroma of 1 or 2. In the lower part there are brown, yellow, or red mottles. In some pedons, large splotches or mottles that have chroma of 2 or 1 are within a depth of 40 inches. The colors are those of the sand grains and are not indicative of wetness.

The lower part of the C horizon, in pedons on benches along the larger streams and rivers, is at a depth of more than 40 inches; it is extremely hard (iron-cemented) sand or fine sand. It has hue of 10YR, value of 5 to 7, and chroma of 3 to 8.

Tomoka series

The Tomoka series consists of very poorly drained soils that formed in well decomposed organic material and in the underlying sandy and loamy mineral material. Permeability is moderate to moderately rapid. The soils are nearly level. They are in freshwater marshes. Slopes are less than 2 percent. In undrained areas the water table is at or above the surface except during extended dry periods. These soils are loamy, siliceous, dysic, hyperthermic Terric Medisaprists.

Tomoka soils are near Bradenton, Delray, Felda, and Floridana soils. All the associated soils are mineral soils

and except for the Delray and Floridana soils are better drained than the Tomoka soils.

Typical pedon of Tomoka muck, about 5 miles southwest of Myakka City and 0.25 mile south of Cason Lake, NW1/4NW1/4 sec. 29, T. 36 S., R. 21 E.

- Oa1—0 to 12 inches; black (5YR 2/1) muck; moderate medium granular structure; friable; extremely acid: gradual wavy boundary.
- Oa2—12 to 18 inches; dark reddish brown (5YR 3/2) muck; moderate medium granular structure; friable, extremely acid; gradual wavy boundary.
- Oa3—18 to 25 inches; black (5YR 2/1) muck; moderate medium granular structure; friable; extremely acid; gradual wavy boundary.
- Oa4—25 to 28 inches; black (5YR 2/1) muck; common coarse distinct gray (10YR 5/1) sand lenses; moderate medium granular structure; friable; extremely acid; clear wavy boundary.
- IIC1—28 to 32 inches; dark gray (10YR 4/1) and light brownish gray (10YR 6/2) sand; single grained; loose; strongly acid; clear wavy boundary.
- IIC2—32 to 35 inches; black (10YR 2/1) sand and loamy sand; single grained; loose; medium acid; abrupt wavy boundary.
- IIIC3—35 to 40 inches; gray (10YR 5/1) sandy clay loam; many fine and medium distinct very dark gray (10YR 3/1) and light gray (10YR 6/1) mottles and streaks of sand; massive; friable; slightly acid; gradual wavy boundary.
- IIIC4—40 to 50 inches; gray (10YR 5/1) sandy clay loam; massive; friable; slightly acid; gradual wavy boundary.
- IIIC5—50 to 75 inches; gray (10YR 5/1) sandy clay loam with common light gray (10YR 6/1) sand pockets and lenses; massive; friable; neutral.

Reaction of the Oa horizon is less than 4.5 in 0.01*M* CaCl2 and from 5.5 to 6.5 in field test. The IIC and IIIC horizons range from very strongly acid to neutral.

The Oa horizon has hue of 10YR or 5YR, value of 2, and chroma of 1 or 2; hue of 5YR, value of 3, and chroma of 2 or 3; or no hue (N) and value of 2. It ranges from 16 to 40 inches in thickness.

The IIC horizon has hue of 10YR or 2.5Y, value of 2 to 6, and chroma of 2 or 1. It ranges from sand to loamy fine sand. The IIIC horizon has hue of 10YR or 2.5Y, value of 2 to 7, and chroma of 2 or 1. It is sandy loam, fine sandy loam, or sandy clay loam. In many pedons there are lenses and pockets of finer or coarser textured material in the lower IIIC horizons.

Wabasso series

The Wabasso series consists of poorly drained, slowly permeable to very slowly permeable soils that formed in sandy and loamy marine sediment. The soils are nearly level. They are in areas of low, broad flatwoods on flood plains. In most years, if the soils are not drained, the water table is at a depth of 10 to 40 inches for more

than 6 months of the year. It is at a depth of less than 10 inches for less than 60 days in wet seasons and is at a depth of more than 40 inches in very dry seasons. In some areas on flood plains, the soils are flooded frequently, and in other areas they are flooded only rarely. Slopes range from 0 to 2 percent. These soils are sandy, siliceous, hyperthermic Alfic Haplaquods.

Wabasso soils are near Bradenton, limestone substratum, Delray, EauGallie, Felda. Floridana, and Palmetto soils. Bradenton, limestone substratum, soils do not have a sandy surface layer that is more than 20 inches thick or a spodic horizon. Delray and Floridana soils have a mollic epipedon, do not have a spodic horizon, and are in depressions. EauGallie soils have an argillic horizon at a depth between 40 and 80 inches. Felda soils do not have a spodic horizon. EauGallie and Felda soils are in the same positions on the landscape as Wabasso soils. Palmetto soils do not have a spodic horizon and are in poorly defined drainageways and sloughs.

Typical pedon of Wabasso fine sand, in an improved pasture, 1 mile north of Florida Highway 64, 1 mile southwest of Manatee River, NW1/4NW1/4 sec. 25, T. 34 S., R. 18 E.

- Ap—0 to 7 inches; very dark gray (10YR 3/1) fine sand; mixture of organic matter and light gray sand grains has a salt and pepper appearance; weak fine granular structure; very friable; many fine and medium roots; strongly acid; clear wavy boundary.
- A21—7 to 12 inches; gray (10YR 5/1) fine sand; single grained; loose; common fine and medium roots; common uncoated sand grains; strongly acid; clear smooth boundary.
- A22—12 to 21 inches; light gray (10YR 7/1) fine sand; single grained; loose; medium vertical dark gray and very dark gray streaks in the matrix and along root channels; few medium roots; very strongly acid; abrupt wavy boundary.
- B21h—21 to 25 inches; black (5YR 2/1) fine sand; massive parting to moderate fine granular; sand grains are well coated with organic matter; few fine roots; very strongly acid; clear wavy boundary.
- B22h—25 to 28 inches; dark reddish brown (5YR 2/2) fine sand; massive parting to weak fine granular; firm: few fine and medium roots; many sand grains coated with organic matter; very strongly acid; clear wavy boundary.
- B3—28 to 31 inches; brown (10YR 4/3) fine sand; few medium faint very dark brown streaks and mottles; single grained; loose; many sand grains are thinly coated with organic matter; very strongly acid; gradual wavy boundary.
- A'2—31 to 37 inches; pale brown (10YR 6/3) fine sand; few fine faint streaks of very dark grayish brown; single grained; loose; medium acid; gradual wavy boundary.

- B'21t—37 to 46 inches; grayish brown (10YR 5/2) sandy loam; few medium prominent red (2.5YR 4/8) and distinct brownish yellow (10YR 6/8) mottles; weak fine granular structure; friable; sand grains are bridged and coated with clay; few fine light gray (10YR 7/1) sand lenses; slightly acid; gradual wavy boundary.
- B'22t—46 to 65 inches; gray (10YR 6/1) sandy clay loam; few coarse distinct reddish yellow (7.5YR 6/6), strong brown (7.5YR 5/8), and dark brown (7.5YR 4/4) mottles; weak fine subangular blocky structure; firm; sand grains are distinctly coated and bridged with clay; few thin patchy clay films on ped faces and in root channels; slightly acid; gradual wavy boundary.
- Cg—65 to 80 inches; gray (10YR 6/1) sand mixed with many fine shell fragments; brownish yellow and strong brown mottles; single grained; mildly alkaline.

Reaction ranges from neutral to very strongly acid in the A, B2h, and B3 horizons and from medium acid to raildly alkaline in the horizons below.

The Ap, or A1, horizon has no hue (N) or has hue of 10YR; value is 2 or 3, and chroma is 1 or 2. It generally has a salt and pepper appearance where undisturbed. It ranges from 3 to 8 inches in thickness. The A2 horizon has hue of 10YR, value of 5 to 7, and chroma of 1 or 2. Total thickness of the A horizon is 16 to 30 inches.

The B2h horizon has hue of 5YR to 10YR, value of 2 or 3, and chroma of 3 or less. It is 7 to 18 inches thick.

The B3 horizon has hue of 5YR to 10YR, value of 4, and chroma of 2 to 4. It is fine sand or sand and ranges to 6 inches in thickness. The B3&Bh horizon, where present, has matrix colors similar to those of the B3 horizon and also has black or dark reddish brown weakly cemented Bh fragments.

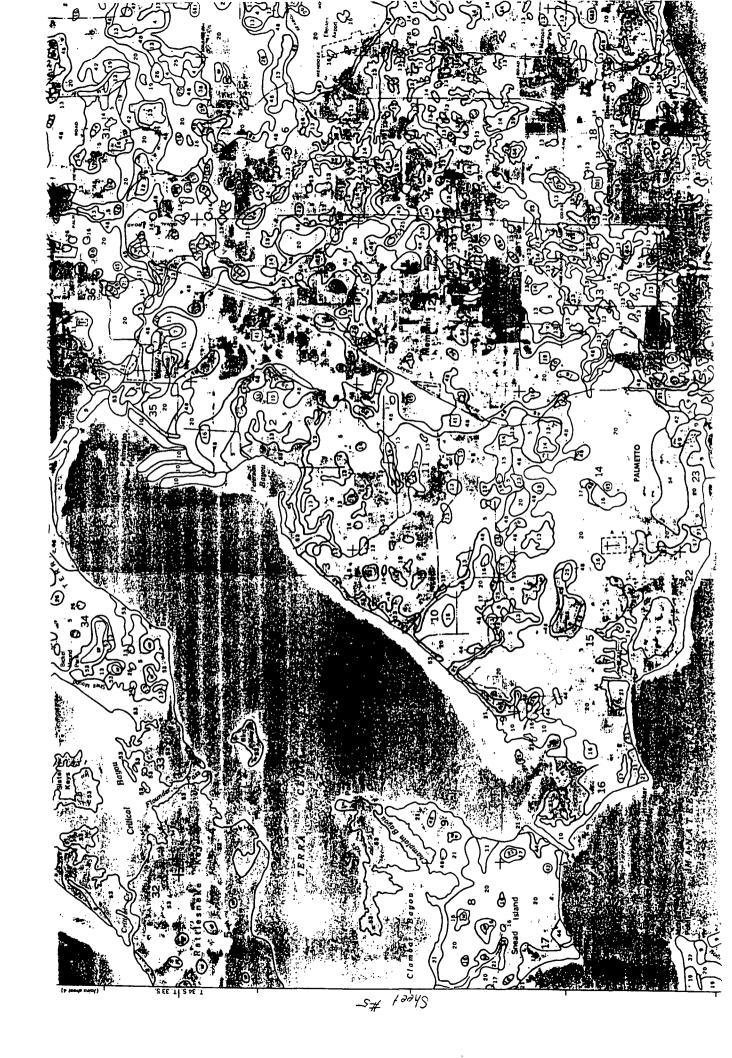
The A'2 horizon has no hue (N) or has hue of 10YR or 2.5Y; value is 5 to 8, and chroma is 3 or less. It is fine sand or sand and ranges to 14 inches in thickness.

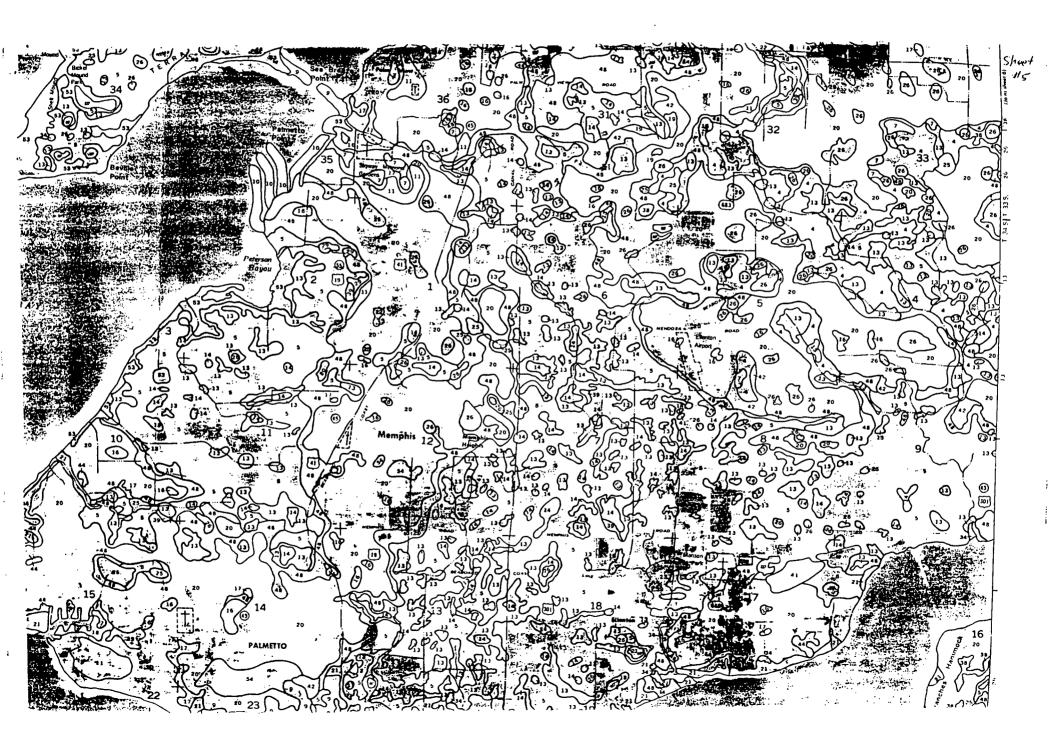
The B'2t horizon has hue of 10YR, 2.5Y, and 5Y, value of 4 to 7, and chroma of 1 to 8. It has gray, brown, yellow, and red mottles. It is fine sandy loam, sandy loam, or sandy clay loam. In some pedons there are few to common, fine and medium nodules of white (10YR 8/1) carbonatic material. The B'2t horizon is at a depth between 26 and 40 inches. It is 15 to 30 inches thick.

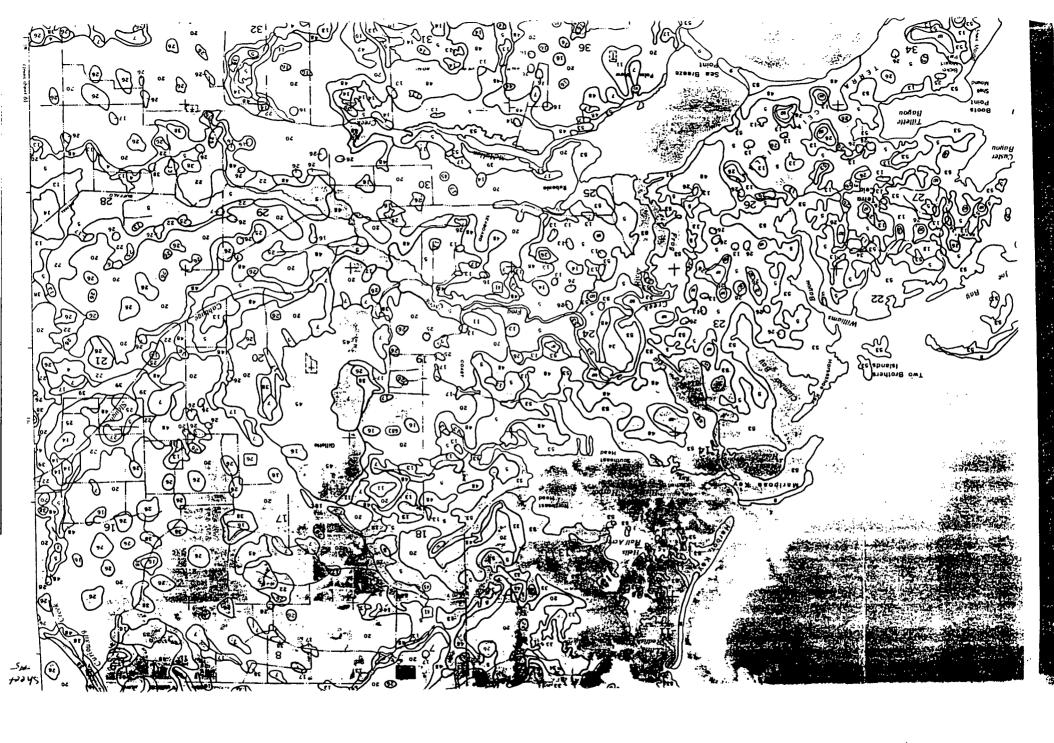
The Cg horizon has no hue (N) or has hue of 10YR; value is 5 to 7, and chroma is 1 or 0. It is a mixture of sand or loamy sand and shell fragments.

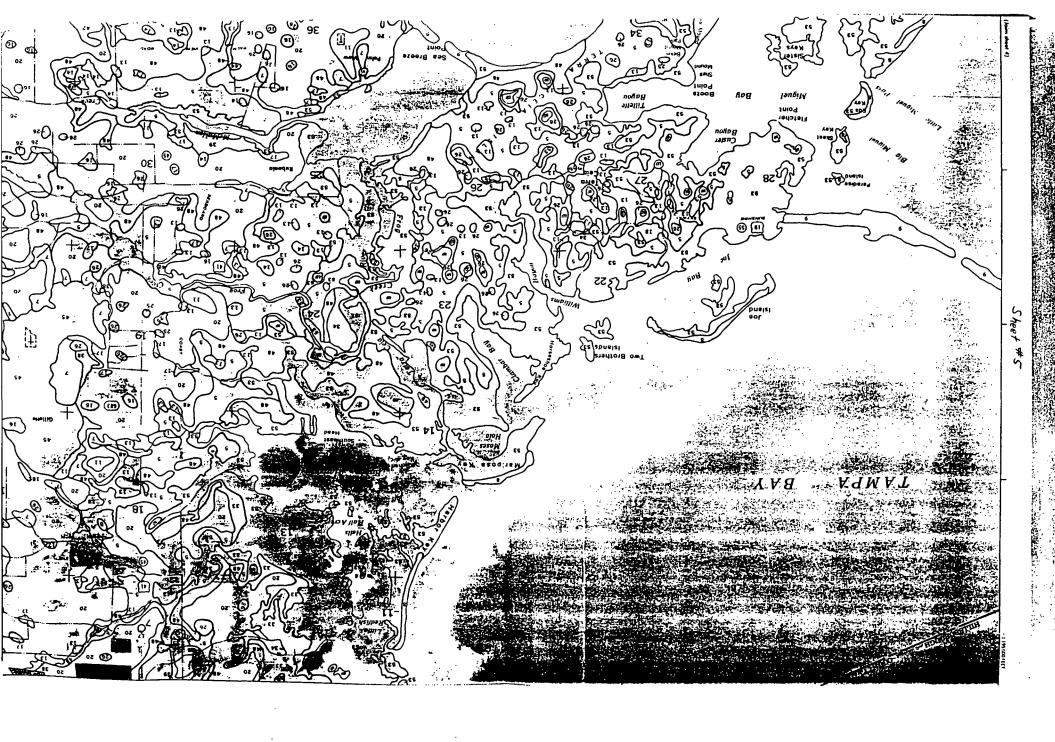
Wabasso Variant

Wabasso Variant soils are poorly drained. They formed in sandy and loamy marine sediment overlying limestone. Permeability is slow to moderately slow. The soils are nearly level. They are in areas of low, broad flatwoods. Slopes are 0 to 2 percent, in most years, if the soils are

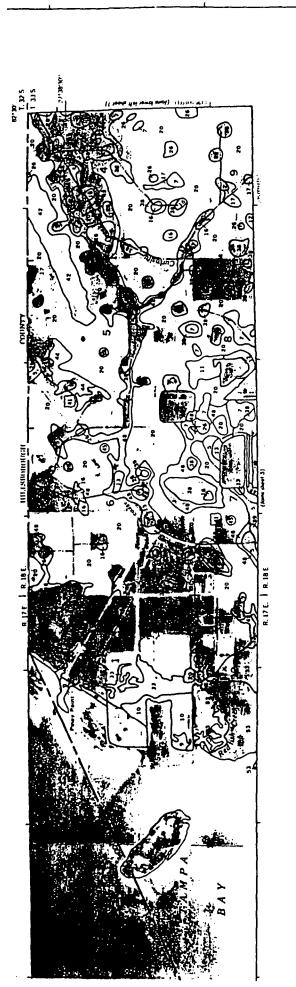




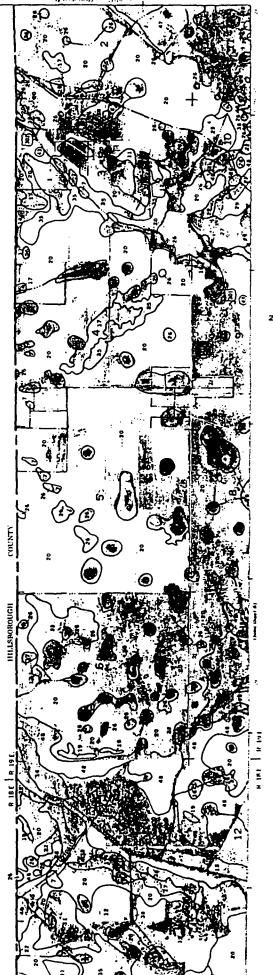




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STATE OF FLORIDA DEPARTMENT OF NATURAL RESOURCES Tom Gardner, Executive Director

DIVISION OF RESOURCE MANAGEMENT
Jeremy A. Craft, Director

FLORIDA GEOLOGICAL SURVEY Walter Schmidt, State Geologist

BULLETIN NO. 59

THE LITHOSTRATIGRAPHY OF THE HAWTHORN GROUP (MIOCENE)
OF FLORIDA

By Thomas M. Scott

Published for the FLORIDA GEOLOGICAL SURVEY
TALLAHASSEE
1988

DEPARTMENT OF NATURAL RESOURCES



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LETTER OF TRANSMITTAL

Bureau of Geology August 1988

Governor Bob Martinez, Chairman Florida Department of Natural Resources Tallahassee, Florida 32301

Dear Governor Martinez:

The Florida Geological Survey, Bureau of Geology, Division of Resource Management, Department of Natural Resources, is publishing as its Bulletin No. 59, *The Lithostratigraphy of the Hawthorn Group (Miocene) of Florida*. This is the culmination of a study of the Hawthorn sediments which exist throughout much of Florida. The Hawthorn Group is of great importance to the state since it constitutes the confining unit over the Floridan aquifer system. It is also of economic importance to the state due to its inclusion of major phosphorite deposits. This publication will be an important reference for future geological investigations in Florida.

Respectfully yours,

Walter Schmidt, Chief Florida Geological Survey

Printed for the Florida Geological Survey

Tallahassee 1988

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SOUTH FLORIDA

Although the Hawthorn Group in south Florida consists of the same general sediment types (carbonate, quartz sand, clay and phosphate), the variability and complexity of the section is different from the strata in northern Florida. In the south Florida area (Figure 1), particularly the western half of the area, the Hawthorn Group consists of a lower, predominantly carbonate unit and an upper, predominantly siliciclastic unit. Eastward the section becomes more complex due to a greater percentage of siliciclastic beds present in the lower portion of the Hawthorn Group.

The differences that exist between the northern and southern sections of the Hawthorn Group require separate formational nomenclature. In southern Florida, the Hawthorn Group consists of in ascending order, the Arcadia Formation (new name) with the Tampa and Nocatee (new name) Members and the Peace River Formation (new name) with the Bone Valley Member (Figure 33). The new nomenclature helps alleviate many of the previously existing problems associated with the relationship of the Bone Valley, Tamiami, Hawthorn, and Tampa units in the south Florida region.

ARCADIA FORMATION Definition and Type Section

The Arcadia Formation is a new formational name proposed here for the lower Hawthorn carbonate section in south Florida. This unit includes sediments formerly assigned to the Tampa Formation or Limestone (King and Wright, 1979) and the "Tampa sand and clay" unit of Wilson (1977).

Dall and Harris (1892) used the term "Arcadia marl" to describe beds along the Peace River. This term was never widely used and did not appear in the literature again except in reference to Dall and Harris. It appears that their use of the "Arcadia marl" described a carbonate bed now belonging in the Peace River Formation of the upper Hawthorn Group. Riggs (1967) used the term "Arcadia formation" for the carbonate beds often exposed at the bottom of the phosphate pits in the Central Florida Phosphate District. Riggs' use of this name was never formalized. The "Lexicon of Geologic Names" (U.S.G.S., 1966) listed the name Arcadia as being used as a member of the Cambrian Trempealeau Formation in Wisconsin and Minnesota, thereby precluding its use elsewhere. Investigations into the current status of this name indicated that the Arcadia member has not been used in some 25 years and does not fit the current Cambrian stratigraphic framework. The Lexicon also indicates Arcadia clays as an Eocene (Claibornian) unit in Louisiana. This name also has been dropped from the stratigraphic nomenclature of Louisiana Geological Survey, 1984, personal communication). Since these former usages of this name are no longer viable, the term can be used for the lower Hawthorn Group sediments in southern Florida in accordance with Article 20 of the North American Code of Stratigraphic Nomenclature (NACSN, 1983).

The Arcadia Formation is named after the town of Arcadia in DeSoto County, Florida. The type section is located in core W-12050, Hogan #1, DeSoto County (SE¼, NW¼, Section 16, Township 38S, Range 26E, surface elevation 62 feet (19 meters)) drilled in 1973 by the Florida Geological Survey. The type Arcadia Formation occurs between -97 feet MSL (-30 meters MSL) to -520 feet MSL (-159 meters) (Figure 34).

Two members can be recognized within the Arcadia Formation in portions of south Florida. These are the Tampa Member and the Nocatee Member (Figure 33). The members are not recognized throughout the entire area. When the Tampa and Nocatee are not recognized, the section is simply referred to as the Arcadia Formation.

Lithology

The Arcadia Formation, with the exception of the Nocatee Member, consists predominantly of limestone and dolostone containing varying amounts of quartz sand, clay and phosphate grains. Thin beds of quartz sand and clay often are present scattered throughout the section. These thin sands and clays are generally very calcareous or dolomitic and phosphatic. Figure 34 graphically illustrates the lithologies of the Arcadia Formation including the Tampa and Nocatee Members. The lithologies of the

Tampa and Nocatee Members will be discussed separately from the undifferentiated Arcadia Formation. Dolomite is generally the most abundant carbonate component of the Arcadia Formation except in the Tampa Member. Limestone is common and occasionally is the dominant carbonate type. The dolostones are quartz sandy, phosphatic, often slightly clayey to clayey, soft to hard, moderately to highly altered, slightly porous to very porous (moldic porosity) and micro- to fine crystalline. The dolostones range in color from yellowish gray (5 Y 8/1) to light olive gray (5 Y 6/1). The phosphate grain content is highly variable ranging up to 25 percent but is more commonly in the 10 percent range. The limestones of the Arcadia are typically quartz sandy, phosphatic, slightly clayey to clayey, soft to hard, low to highly recrystallized, variably porous and very fine to fine grained. The limestones are typically a wackestone to mudstone with few beds of packstone. They range in color from white (N 9) to yellowish gray (5 Y 8/1). The phosphate grain content is similar to that described for the dolostones. Fossils are generally present only as molds in the carbonate rocks.

Clay beds occur sporadically throughout the Arcadia Formation. They are thin, generally less than 5 feet thick, and of limited areal extent. The clays are quartz sandy, silty, phosphatic, dolomitic and poorly to moderately indurated. Color of the clay ranges from yellowish gray (5 Y 8/1) to light olive gray (5 Y 6/1). Lithoclasts of clay are often found in other lithologies. Smectite, illite, palygorskite, and sepiolite comprise the clay mineral suite (Reynolds, 1962).

Quartz sand beds also occur sporadically and are generally less than 5 feet thick. They are very fine to medium grained (characteristically fine grained), poorly to moderately indurated, clayey, dolomitic and phosphatic. The sands are usually yellowish gray (5 Y 8/1) in color.

Chert is also sporadically presently in the Arcadia Formation in the updip areas (portions of Polk, Hillsborough, Manatee and Hardee Counties). In many instances the chert appears to be silicified clays and dolosilts.

Subjacent and Suprajacent Units

The Arcadia Formation overlies either the Ocala Group or the "Suwannee" Limestone in the south Florida region (Figure 8). The contact between the basal Arcadia and the Ocala Group is an easily recognized unconformity. In the north central and northeastern portions of southern Florida, where the Hawthorn Group overlies the Ocala Group (Figures 8 and 41), the Arcadia is characteristically a gray, hard, quartz sandy, phosphatic dolostone with a few siliciclastic interbeds. This is in contrast to the Ocala Group, which is a cream to white, fossiliferous, soft to hard limestone (packstone to wackestone).

Throughout most of south Florida, the Hawthorn Group overlies limestones most often referred to as the "Suwannee" Limestone (Figure 33). In much of this area the contact is recognizably unconformable. The contrast between the sandy, phosphatic, fine-grained to finely crystalline carbonates of the Arcadia and the coarser grained nonphosphatic, non-quartz-sandy limestones of the "Suwannee" Limestone allow the contact to be easily placed. However, in the downdip areas (e.g., Lee and Charlotte Counties and further south) the contact becomes more obscure. In this area the contact is placed at the base of the last occurrence of a sandy, variably phosphatic carbonate.

The limestones underlying the Arcadia are referred to as "Suwannee" limestone due to the uncertainty of the formational assignment. These sediments have characteristically been called "Suwannee" by previous workers despite the fact that they have never been accurately correlated with the typical Suwannee Limestone in northern Florida. Hunter (personal communication, 1984) believes that these carbonates are not Suwannee or the equivalent but are an unnamed limestone of Chickasawhayan Age (Late Oligocene).

Unconformably overlying the Arcadia Formation is the Peace River Formation (Figure 33). The Peace River Formation is predominantly a siliciclastic unit with varying amounts of carbonate beds. The percentage of carbonate beds is higher near the base of the Peace River, resulting in a transitional or gradational contact with the Arcadia. In some areas the contact is often marked by a phosphatic rubble zone and/or a phosphatized dolostone hardground. In the more gradational sequence the contact is placed where the carbonate beds become significantly more abundant than the siliciclastic beds.

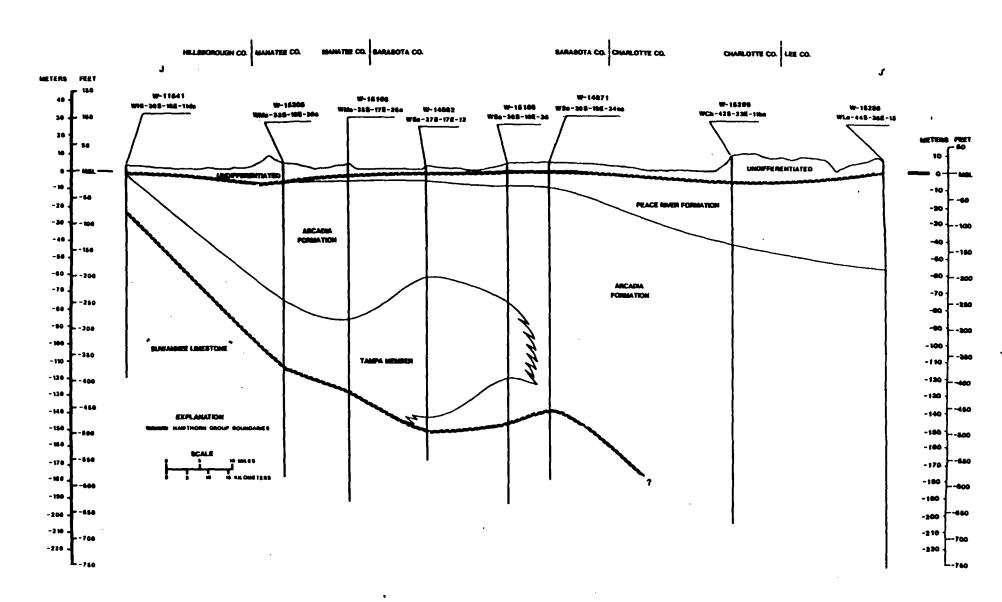


Figure 38. Cross section J-J' (see figure 3 for location).

Lithology

The Tampa Member consists predominantly of limestone with subordinate dolostone, sands, and clays. The lithology of the Tampa is very similiar to the limestone portion of the Arcadia Formation with the exception of its phosphate content which is almost always noticeably less than in the Arcadia. Phosphate grains generally are present in the Tampa in amounts less than 3 percent although beds containing greater percentages do occur, particularly near the facies change limits of the member.

Lithologically, the limestones are variably quartz sandy and clayey with minor to no phosphate. Fossil molds are often present and include mollusks, foraminifera and algae. Colors range from white (N 9) to yellowish gray (5 Y 8/1). The limestones range from mudstones to packstones but are most often wackestones. The dolostones are variably quartz sandy and clayey with minor to no phosphate. They are typically microcrystalline to very fine grained and range in color from pinkish gray (5 YR 8/1) to light olive gray (5 Y 6/1). The dolostones often contain fossil molds similar to those in the limestones.

Sand and clay beds occur sporadically within the Tampa Member. Lithologically, they are identical to those described for the Arcadia Formation except for the phosphate content which is significantly lower in the Tampa Member.

Siliceous beds are often present in the more updip portions of the Tampa. In the type area near Tampa Bay the unit is well known for silicified corals, siliceous pseudomorphs of many different fossils and chert boulders.

Subjacent and Suprajacent Units

The Tampa Member overlies the "Suwannee" Limestone in areas where the Nocatee Member is not present and the Tampa Member forms the base of the Arcadia. The boundary often appears gradational as discussed by King (1979) and King and Wright (1979). Figure 19 indicates an unconformable time relationship with the "Suwannee" Limestone which often is not apparent lithologically. This indicates a probable reworking of underlying materials into the Tampa Member obscuring the unconformity.

The Tampa Member overlies the Nocatee Member in the area where both are present (Figure 33). The contact appears conformable and is easily recognized. In a few areas where the Nocatee is absent, the Tampa may overlie undifferentiated Arcadia Formation sediments. The Tampa Member may be both overlain and underlain by undifferentiated Arcadia.

The Tampa Member is overlain throughout most of its extent by carbonates of the undifferentiated Arcadia Formation. The contact often appears gradational over one or two feet. An increase in phosphate grain content is the dominant factor in defining the lithologic break. In updip areas the Tampa may be overlain by siliciclastic sediments of the Peace River Formation. Further updip it may be exposed at the surface or covered by a thin veneer of unconsolidated sands and clays which may represent residuum of the Hawthorn sediments. Figure 35 through 39 show the relationship of the Tampa Member to the overlying and underlying units.

Thickness and Areal Extent

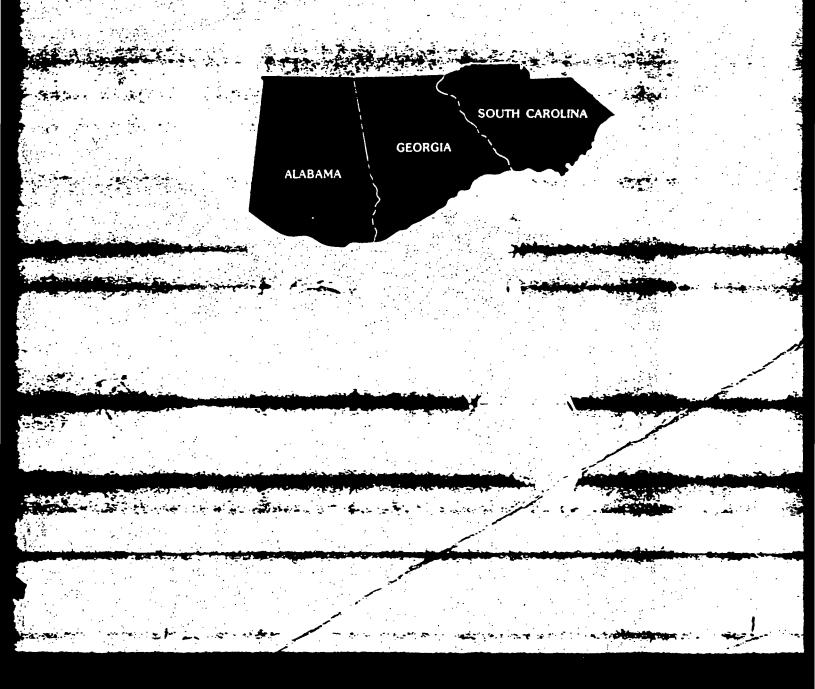
The Tampa Member is quite variable in thickness throughout its extent. It thins updip to its northern limit where it is absent due to erosion and possibly nondeposition. The thickest section of Tampa encountered is in W-14882 in Sarasota County where 270 feet (82 meters) of section are assigned to this member (Figure 45). More typically an average thickness is approximately 100 feet (30.5 meters).

The top of the Tampa Member (Figure 46) ranges in elevation from as high as +75 feet (23 meters) MSL in northeastern Hillsborough County to -323 feet (-98.5 meters) MSL in northern Sarasota County. The lowest elevation for the top of the unit occurs in a rather large depression that encompasses part of northern Sarasota County and southern Manatee County.

The Tampa dips towards the south in the northern half of the area of occurrence (Figure 46). Dip direction in the southern half is more to the southwest and west. Dip angle varies from place to place but the

HYDROGEOLOGIC FLORIDAN AQUIFER STSTEM IN TEORIDA AND IN PARTS OF GEORGIA, ALABAMA, AND SOUTH CAROLINA

REGIONAL AQUIFER-SYSTEM ANALYSIS

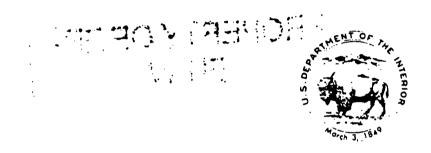


Hydrogeologic Framework of the Floridan Aquifer System in Florida and in Parts of Georgia, Alabama, and South Carolina

By JAMES A. MILLER

REGIONAL AQUIFER-SYSTEM ANALYSIS

U.S. GEOLOGICAL SURVEY PROFESSIONAL PAPER 1403-B



grade updip by facies change into calcareous, glauconitic, clastic rocks. This carbonate-clastic transition lies farther to the north and west in lower Eocene strata than it does in the underlying Paleocene and is located still farther north and west in middle Eocene rocks. Upper Eocene rocks retain their carbonate character in many places up to the point where they are truncated by erosion. The overall effect is that of a general regional transgression that began in Paleocene time and persisted through the late Eocene and during which the marine facies of progressively younger rocks extended progressively farther and farther inland. Several minor regressions punctuated this general transgression. These observations are consistent with the sea level curve of Vail and others (1977), which shows that sea level worldwide became progressively higher from early to late Eocene time.

ROCKS OF EARLY EOCENE AGE

Downdip, a lower Eocene carbonate sequence underlies southeastern Georgia and the Florida peninsula: updip, the remainder of the study area is underlain by clastic lower Eocene rocks. Locally, in South Carolina, the Eocene in the subsurface is an impure limestone. Plate 4 shows the configuration of the top of rocks of early Eocene age and the area where they crop out. Comparison of plate 4 with a map of the structural surface of the Paleocene (pl. 3) shows that, in Alabama and southwestern Georgia, lower Eocene rocks lie to the south and east of Paleocene rocks in offlap relationship. In central Georgia, however, beds of early Eocene age overlap and extend farther to the north than the underlying Paleocene rocks. Lower Eocene rocks are known to extend farther to the north in this overlap area than plate 4 shows, but they have been mapped during this study only to the limits of the well control used to delineate the Floridan aquifer system. In the western part of the study area, the configuration of the top of the early Eocene is contoured up to the limit of outcrop of these rocks (pl. 4).

Many of the large to intermediate-scale structural features that affect the shape of the Paleocene surface (pl. 3) are recognizable on the early Eocene surface (pl. 4). Those features common to both maps include (1) the Peninsular arch in north-central Florida, (2) the Southeast Georgia embayment, and (3) a steep, steady slope toward the Gulf Coast geosyncline in the western part of the study area. The Southwest Georgia embayment in eastern panhandle Florida is a negative area on both the Paleocene and early Eocene tops, but this feature is deeper and narrower and extends farther to the northeast on the early Eocene surface than it does

on the top of the Paleocene. The configuration of the South Florida basin in southwestern peninsular Florida likewise differs on the Paleocene and early Eocene surfaces. This feature was somewhat silled on its gulfward side in Paleocene time (pl. 3) but, at the end of early Eocene time (pl. 4) it was open to the gulf and appears to have been partially filled from the east and northeast. The Suwannee strait, a closed low that appears in southeastern Georgia on the map of the Paleocene surface, was apparently filled with sediments during early Eocene time and thus does not exist on the map of the early Eocene surface.

The maximum measured depth to the top of lower Eocene rocks is about 3.900 ft below sea level in well ALA-BAL-30 in the southern part of Baldwin County. Ala. The maximum contoured depth is below 4.200 ft. in the same general area. Lower Eocene rocks are slightly less than 800 ft below sea level on the crest of the Peninsular arch, from which they deepen in all directions. In the Southwest Georgia embayment and the South Florida basin, the top of lower Eocene rocks is below 2.600 ft.

The thickness of lower Eocene strata is shown on plate 5. along with the distribution of the clastic and carbonate facies within this unit. The clastic-carbonate boundary and much of the contouring shown on this plate are derived from well control. In areas of sparse control, the thickness of the early Eocene has been estimated as the difference between contoured altitudes of the top of the early Eocene (plate 4) and the top of the Paleocene (plate 3). In south Florida, lower Eocene rocks are more than 1.500 ft thick; in parts of panhandle Florida, they are more than 1.100 ft thick. On the crest of the Peninsular arch, these strata are less than 300 ft thick, and they thin to a featheredge in areas of outcrop.

MOLDSMAR FORMATION—Except for the Fishburne Formation that occurs locally in South Carolina, all the lower Eocene carbonate rocks in the study area are part of the unit that Applin and Applin (1944) named the Oldsmar Limestone. The Oldsmar, however, contains much dolomite, and thin beds of chert and evaporite deposits occur in the unit from place to place. The Oldsmar is therefore referred to as a "formation" rather than a "limestone."

The Oldsmar Formation consists mostly of off-white to light-gray micritic to finely pelletal limestone thickly to thinly interbedded with gray to tan to light-brown. fine to medium crystalline, commonly vuggy dolomite. The lower part of the formation is usually more extensively dolomitized than the upper part. Pore-filling gypsum and thin beds of anhydrite occur in the lowermost parts of the Oldsmar in places, particularly in a crescent-shaped band extending from Dixie County, Fla., northeast to southern Ware County, Gz

The location of this band, which locally comprises the base of the Floridan aquifer system, is shown on plate 33. In scattered places, the Oldsmar contains trace amounts of glauconite.

Applin and Applin (1944, p. 1699) defined the Oldsmar "to include the interval that is marked at the top by the presence of abundant specimens of Helicostegina gyralis Barker and Grimsdale...and that rests on the Cedar Keys limestone." This definition is unsatisfactory because (1) it is based on the microfaunal content of the strata, not on their lithologic characteristics, and (2) it is based on a species whose range is not restricted to the early Eocene. The author has found specimens of H. gyralis that show no evidence of reworking 50 to 70 ft above the top of the Oldsmar in rocks that are part of the overlying middle Eocene sequence ("Lake City" Limestone). Cole and Gravell (1952) reported this species from middle Eocene beds in Cuba. The Oldsmar Formation is thus redefined herein as the sequence of white to gray limestone and interbedded tan to light-brown dolomite that lies between the pelletal, predominantly brown limestone and brown dolomite of the middle Eocene and the grav. coarsely crystalline dolomite of the Cedar Keys Formation. H. gyralis is commonly found as part of a characteristic Oldsmar fauna that includes several other species of larger foraminifers listed in table 1. None of these species, however, is ubiquitous within the Oldsmar Formation, nor should they be the criterion by which the Oldsmar is defined.

The Oldsmar Formation underlies all of the Florida peninsula and the southeastern corner of Georgia (pl. 5). Westward, in the eastern part of the Florida panhandle, the Oldsmar becomes increasingly argillaceous and interfingers with calcareous clastic rocks. To the north, in south-central Georgia, the Oldsmar grades from limestone through argillaceous limestone and calcareous clay into glauconitic calcareous sand.

In addition to *H. gyralis*, the larger Foraminifera *Miscellanea nassauensis* Applin and Jordan. *Pseudophragmina (Proporocyclina) cedarkeysensis* Cole. and *Lockhartia sp.* are considered characteristic of the Oldsmar Formation.

Underted Neiverd Lower Eocene rocks in the western part of the Florida panhandle consist of brownish to greenish-gray, calcareous, slightly glauconitic shale and siltstone that are occasionally micaceous. Thin beds of fine-grained, slightly glauconitic sandstone and off-white sandy glauconitic limestone occur sporadically throughout the predominantly argillaceous section. These rocks are part of the unit that was called the "clastic facies of Wilcox age" by Applin and Applin (1944) and the "Wilcox Formation" by Chen (1965). Both Chen and the Ap-

plins included beds that are the downdip equivalents of the Nanafalia Formation. the Tuscahoma Formation. and the Salt Mountain Limestone in their "Wilcox" unit. In this report, the Nanafalia. Tuscahoma, and Salt Mountain are considered to be of Paleocene age and to grade downdip into undifferentiated argillaceous rocks of Paleocene age. The term "undifferentiated early Eocene rocks" is herein applied to the massive, predominantly argillaceous early Eocene section of western panhandle Florida. These strata grade eastward into the Oldsmar Formation and become less marine and slightly coarser grained updip in southern Alabama and southwestern Georgia, where they take on the character of the outcropping Hatchetigbee Formation.

Microfauna considered characteristic of undifferentiated rocks of early Eocene age include the Foraminifera Globorotalia formosa gracilis Bolli and Rotalia trochoidiformis (Lamarck). The Foraminifera Globorotalia subbotinae Morozova and G. wilcoxensis (Cushman and Ponton) are also considered characteristic of early Eocene rocks in the study area. even though these species are known to range downward into rocks of late Paleocene age elsewhere (Stainforth and others. 1975). The Ostracoda Brackhevthere jessupensis Howe and Garrett and Haplocytheridea sabinensis (Howe and Garrett) are also considered characteristic of these beds.

Bashi and Hatchetigbee Formations—The lithology of the Hatchetigbee Formation in the area where it crops out in western Alabama is very similar to that of the underlying Tuscahoma. In practice, the two are difficult to separate except where the sandy, glauconitic, highly fossiliferous Bashi Formation (Gibson, 1982b) lies between them. The Bashi occurs only as erosional remnants in eastern Alabama and western Georgia. Downdip, the Hatchetigbee consists of interbedded fine sand and gray calcareous clay. The sand is lost in a short distance gulfward, and the argillaceous Hatchetigbee beds merge in middip areas with the underlying clay of the Tuscahoma.

Unnamed MID-Georgia Lower Eocene rocks—In the west-central part of the Georgia coastal plain, lower Eocene rocks consist of medium-grained, calcareous, often dolomitic, glauconitic sandstone interbedded with soft, light-gray, calcareous, glauconitic clay. The sandstone ranges from unconsolidated to well indurated, depending on the amount of calcareous matrix that binds the sand grains. Although these strata are the probable equivalents of the combined Hatchetigbee Formation of eastern Alabama and southwestern Georgia, they are unnamed at present and are not shown on the correlation chart (pl. 2) because their relation to the Hatchibtigbee is still inexactly known.

Georgia and peninsular Florida appear to die out downward within the middle Eocene. An exception is the fault in Palm Beach County. Fla., which cuts rocks at least as old as Paleocene (pl. 3). The series of northeast-trending faults in south-central Georgia bounds several small grabens and half grabens that are collectively called the Gulf Frough (Herrick and Vorhis, 1963). Like most of the faults in peninsular Florida. the Gulf Trough faults appear to die out at shallow depths. A seismic profile was obtained across one of the major Gulf Trough faults in northeastern Colquitt County, Ga., as part of this study. The record on this profile is poor down to a depth of approximately 1,200 ft below land surface. Deeper than about 1,300 ft troughly the middle of rocks of middle Eocene age), however, sharp reflectors can easily be traced on the profile and do not show the graben structure that well data prove to exist at shallower depths.

The maximum measured depth to the top of the middle Eocene is 3.490 ft below sea level in well ALA-BAL-30 in southwestern Baldwin County, Ala. The maximum contoured depth is below 3.700 ft in the same area (pl. 6). The top of the middle Eocene slopes in all directions from the crest of the Peninsular arch and reaches depths of more than 1.800 ft in the Southwest Georgia embayment, more than 1.600 ft in the South Florida basin, and more than 1.000 ft in the Southeast Georgia embayment. Middle Eocene rocks are slightly above sea level at scattered places on the Peninsular arch. They are exposed at the surface in Citrus and Levy Counties, Fla., where they represent the oldest outcropping rocks in the state.

The thickness of middle Eocene rocks is shown on plate 7, which also shows the limits of the unit's clastic and carbonate facies. The position of the interface between these facies is approximate because it is based on well control. The thickness trends shown on plate 7 have been extended in areas where well control is scattered by subtracting the contoured tops of rocks of early and middle Eocene age. From a featheredge in outcrop areas, the middle Eocene thickens seaward to more than 1,200 ft in the Southwest Georgia embayment and to more than 1.000 ft in southeastern Georgia. Along panhandle Florida's Gulf Coast, these strato are more than 900 ft thick. They thin to less than 500 ft over the crest of the Peninsular arch and thicken southward to more than 1,600 ft in east-central peninsular Florida. Although the middle Eocene is between 1.000 and 1.400 ft thick in most of southern Florida. the unit thins to less than 900 ft in part of the South Florida basin, and shows that this basin was not subsiding rapidly during middle Eocene time.

Avon Park Formation—Applin and Applin (1944, p. 1686) applied the name Avon Park Limestone to the

upper part of the late middle Eocene section in a well at the Avon Park Bombing Range in the southernmost part of Polk County. Fla. They referred to the Avon Park as "a distinct faunal unit" and described it as "mainly cream-colored, highly microfossiliferous, chalky limestone" that locally contains some gypsum and chert and that is commonly partially dolomitized. Well cuttings examined during this study show that the Avon Park is in many places composed almost entirely of dolomite. The Avon Park is thus referred to in this report as a "formation" rather than a "limestone."

The term Lake City Limestone was introduced by Applin and Applin (1944, p. 1693) for the lower part of rocks of middle Eocene age in a well at Lake City in Columbia County. Fla. The Lake City was described as "alternating layers of dark brown and chalky limestone": gypsum and chert are present in some wells. Regionally, the lower part of the middle Eocene. like the upper part, contains much dolomite.

In the early 1940's, there were few deep wells in Florida, and the samples from many of these wells were either contaminated or incomplete. Electric logging was a new technique at the time, and those few logs that were in existence were largely unreliable. A common practice in subsurface stratigraphy was to use paleontologic and lithologic units interchangeably. All of these factors led to imprecise definitions for most of the limestone units of Florida. Between some adjacent "formations," lithologic change is subtle: in places, there is no change at all. Stratigraphic breaks in much of the Florida section currently are based upon a change in the benthic microfauna that the rocks contain. Where dolomitization has obliterated the microfauna, or where it is lacking in nondolomitized sections, correlations are inconsistent. Although most workers studying the Florida subsurface recognize the problem, almost all Tertiary limestone correlations are still made on the basis of the microfaunal assemblages that Applin and Applin (1944) and Applin and Jordan (1945) thought were diagnostic. This practice is, of course, not in accordance with the rules of the current North American Stratigraphic Code (North American Commission on Stratigraphic Nomenclature, 1983). Units that are in reality biostratigraphic units have been mapped as if they were rock-stratigraphic units. Fortunately, as Winston (1976), recognized, the paleontologically defined units of Applin and Applin (1944) in many cases coincide with lithologic units. Exceptions to this generalization are the Avon Park and Lake City Limestones.

There are no lithologic criteria that can be used to separate the middle Eocene carbonate rocks in Florida and in southern Georgia. Both the so-called Avon Park and Lake City Limestones consist primarily of

cream, tan, or light-brown, soft to well-indurated limestone that is mostly pelletal but is locally micritic. The pellets consist of fine to coarse sand-sized particles of micritic to fine crystalline limestone and small- to medium-sized Foraminifera: they are bound by a micritic to finely crystalline limestone matrix. The limestone is thinly to thickly interbedded with cream or light- to dark-brown, fine to medium crystalline, slightly vuggy dolomite, fractured in some places, whose texture is locally sucrosic to argillaceous. Locally, differences exist between the general lithologic character of the lower part of the middle Eocene and that of its upper part. Unfortunately, two of the limited number of wells available to the Applins (the Avon Park Bombing Range and Lake City wells) showed such contrasts, and it was on the basis of the limited data then available that the Avon Park and Lake City were named and extended regionally. More recent drilling shows conclusively that the rock types that the Applins thought were representative of their "Lake City" are found in many places at the top of the middle Eocene (in their "Avon Park" part) and the reverse is also true

Paleontologic criteria by which the Avon Park and Lake City can be differentiated are lacking. In the original definition of both the Avon Park and the Lake City, certain faunal zones by which these units could be recognized were listed. The Lake City was thought to extend from the highest occurrence of Dictyoconus americanus (Cushman), accompanied by Fabularia vaughani Cole and Porter, down to the highest occurrence of Helicostegina gyralis Barker and Grimsdale. thought to characterize the Oldsmar. None of these species is restricted to the horizon for which it is supposed to be characteristic. H. gyralis commonly occurs several hundred feet above a typical Oldsmar lithology. In this study, Fabularia vaughani has been found at or just below the top of the middle Eocene—in the "Avon Park" part. Dictyoconus americanus has been reported by Cole (1944, 1945) and by Vernon (1951) from the upper part of the middle Eocene. The author has found several additional species that were listed as diagnostic Lake City Foraminifera by Applin and Jordan (1945) within 20 to 50 feet of the top of the uppermost middle Eocene. These species include Discorbis inornatus Cole, Fabularia gunteri Applin and Jordan, and Gunteria floridana Cushman and Ponton. Cole and Gravell (1952) found several supposedly diagnostic Lake City species in the same beds as supposedly diagnostic Avon Park species in the outcropping middle Eocene of Cuba. The Avon Park was originally defined by Applin and Applin (1944) as extending from the highest occurrence of Coskinolina floridana Cole downward to the top of Dictyoconus americanus. As Applin and Applin (1944, p. 1687), recognized, however, that Coskinolina floridana is abundant in the Oligocene Suwannee Limestone in many places.

The so-called Avon Park and Lake City Limestones cannot be distinguished from each other on the basis of either lithology or fauna, except locally. Therefore, it is here proposed that the term "Lake City" be abandoned and that all of the cream to brown pelletal limestone and interbedded brown to cream dolomite of middle Eocene age in peninsular Florida and southern Georgia be placed in the Avon Park Formation. The term "Avon Park" is retained because (1) it has precedence over the term "Lake City." (although both the Avon Park and the Lake City were named in the same report by Applin and Applin (1944), the Avon Park was described on an earlier page in that paper) and (2) the term has traditionally been applied to rocks whose lithology is different from that of the overlying Ocala Limestone. The Avon Park is more properly called a "formation" rather than a "limestone" because it contains appreciable amounts of rock types other than limestone. The extended definition of the Avon Park Formation proposed here refers to the sequence of predominately brown limestones and dolomites of various textures that lies between the gray, largely micritic limestones and gray dolomites of the Oldsmar Formation and the white foraminiferal coquina or fossiliferous micrite of the Ocala Limestone.

The reference section proposed for the extended Avon Park Formation is the interval from 221 to 1,190 ft below land surface in the Coastal Petroleum Company's No. 1 Ragland well in sec. 16, T. 15 S. R. 13 E. in Levy County. Fla. Cuttings from this well are on file at the Florida Bureau of Geology, Tallahassee, Fla., as well W-1537 or permit number 66. The well is numbered FLA-LV-4 in this report. A lithologic description of the cuttings from the proposed type well is given in the Appendix of this report. The top of the Avon Park is not known in the type well because there is a gap in the cuttings from the basal Ocala at a depth of 110 ft to the uppermost Avon Park sample at 221 ft. Figure 5 shows a representative electric log pattern for the Avon Park Formation (extended) in a nearby well in Levy County, Humble's No. 1 C. E. Robinson (well FLA-LV-5 of this report).

Fauna considered characteristic of the revised Avon Park Formation include the Foraminitera Spirolina corevensis (Cole). Lituonella floridana (Cole). Discorbis inornatus Cole. Valvulina cushmani Applin and Jordan. V. martii Cushman and Bermudez. Fabularia vaughani Cole and Ponton. Textularia corevensis Cole. Giunteria floridana Cushman and Ponton. Pseudorbitolina cubensis Cushman and Bermudez. Amphistegina lopeztrigoni Palmer. and Lepidocyclina antillea Cushman (formerly called L. gardnerae Cole). Fragments of the alga Clypeina infundibuliformia Morellet

and Morellet are also considered characteristic of the Avon Park.

To the north and west, the Avon Park Formation grades into an argillaceous, soft to semi-indurated, micritic, glauconitic limestone that in turn grades updip into calcareous, glauconitic, often shelly sand and clay beds that are parts of the Lisbon and Tallahatta Formations. The middle third of the revised Avon Park Formation in the eastern half of the Florida peninsula and in much of southeastern Georgia is micritic. low-permeability, finely pelletal limestone. Approximately the lower half of the extended Avon Park in west-central peninsular Florida consists of low-permeability dark-colored gypsiferous limestone and dolomite. Both the micritic limestone and the gypsiferous carbonate beds comprise important subregional confining units within the Floridan aquifer system.

TALLAHATTA FORMATION—Where the Tallahatta Formation crops out in western Alabama, it consists largely of greenish-gray, porous, fine-grained siliceous claystone (called buhrstone in older reports) and some interbedded sands that are calcareous and fossiliferous near the top of the unit. In eastern Alabama, the outcropping Tallahatta is mostly poorly sorted, occasionally gravelly sand interbedded with greenish-gray clay and calcareous sand near the top. In southwestern Georgia, the outcropping Tallahatta is somewhat more marine than it is in Alabama and consists of fine-to coarse-grained slightly fossiliferous sand interbedded with dark-brown, silty, micaceous, occasionally glauconitic limestone. Chert is common near the base of the Tallahatta in updip areas in Georgia.

Downdip, in both Alabama and Georgia, the Tallahatta consists largely of interbedded gray to greenish-gray glauconitic sand and greenish-gray to brownish-gray shale: light- to dark-brown glauconitic fossiliferous limestone is common. Farther seaward in Georgia, the Tallahatta grades into cream to light-gray glauconitic, argillaceous, somewhat sandy limestone that in turn grades into the revised Avon Park Formation. Along and just to the north of the Gulf Coast of Alabama and western panhandle Florida, the Tallahatta consists mostly of gray to greenish-gray clay and thin to moderately thick interbeds of fine-grained. glauconitic, calcareous sand. Neither the limestone facies nor the calcareous clay and sand of western Florida and southern Alabama can be distinguished from similar overlying strata that are considered to be the Lisbon Formation in this study. In northeastern Georgia, the Tallahatta is mostly gray, calcareous, fossiliferous clay and has a thin sequence of calcareous sand and glauconitic limestone at the base. These strata grade northeastward into calcareous shelly sand

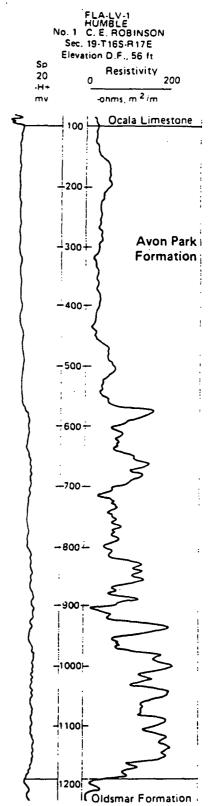


Figure 5. Representative electric log pattern for the Avon Park Formation.

sists of carbonate rocks throughout all of the study area except for southwestern Alabama, western panhandle Florida, and parts of northeastern Georgia and southwestern South Carolina, where clastic strata make up an important part of the Oligocene. The few scattered outliers of Oligocene lying between the two main bodies shown on plate 10, indicate that these rocks extended over a much wider area before being removed by erosion. Older rocks are exposed at scattered places within the widespread but generally thin body of the Oligocene in Georgia, where erosion has removed all of the Oligocene locally. The locations of most of the Oligocene outliers and the places where Oligocene rocks have been stripped are based on well data compiled for this study. A few of these features. however, are located from published sources, and thus lie in places where no well control is shown on plate 10. Erosional remnants to the north and west of the general updip limit of the Oligocene show that these rocks once extended over a much wider area.

Both large- and small-scale structural features affect the configuration of the Oligocene top. Largescale features include (pl. 10) (1) the steep gulfward slope of the unit in southwestern Alabama, which reflects subsidence of the Gulf Coast geosyncline, (2) the low area in southern Gulf County, Fla., that represents the Southwest Georgia embayment, (3) the negative area in Glynn County, Ga., and adjacent counties that is the Southeast Georgia embayment, and (4) a low area in southwestern peninsular Florida that may represent a remnant of the South Florida basin. The northwest-southeast orientation of the axis of the South Florida basin is different from its alinement on the surface of older rock units (compare, for example, pis. 5 and 10). The high area shown on the Oligocene surface along the Gulf of Mexico parallel to the South Florida basin is not present on the upper Eocene top. This high probably acted as a sill or barrier during Oligocene time and partly restricted open circulation between the South Florida basin and the ocean. Smaller structural features shown on plate 10 include the northeast-trending series of small grabens in central Georgia that are collectively called the Gulf Trough and a coast-parallel normal fault that extends from Indian River County southeast through Martin County. Fla. The Oligocene has been eroded from the upthrown side of this fault but is preserved on its downthrown side.

The Oligocene top slopes generally seaward from a high of more than 300 ft above sea level in the unit's outcrop area in central Georgia to slightly more than 600 ft below sea level in both the Southwest and Southeast Georgia embayments. This general seaward slope is interrupted in northern Florida by a high area extending from Leon County eastward to Columbia

County, where Oligocene rocks crop out. From a second outcrop area that extends southward from Citrus to Hillsborough Counties. Fla., Oligocene rocks slope into the South Florida basin, where the Oligocene top is more than 900 ft below sea level. The maximum measured depth to the top of the Oligocene is about 2.680 ft below sea level in well ALA-BAL-30 in southern Baldwin County. Ala. The maximum contoured depth is below 3.200 ft, to the southwest of this well. Although the top of the Oligocene is affected locally by erosion and karst topography, it is not as irregular as the top of upper Eocene strata.

The thickness of the Oligocene Series is shown on plate 11. Most of the contouring shown on this plate is based on well data. Where wells are scattered, the thickness of Oligocene rocks has been estimated by subtracting contours that represent the tops of upper Eocene and Oligocene rocks (pls. 8 and 10). Oligocene strata are generally less than 200 ft thick in the study area. Exceptions are southwestern Florida, where these rocks are more than 400 ft thick: southern Gulf and Franklin Counties, Fla., where they are more than 600 ft thick: and the southernmost part of Alabama. where they are more than 800 ft thick. These thick areas represent the South Florida basin, the Southwest Georgia embayment, and the northeastern rim of the Gulf Coast geosyncline, respectively. Throughout most of eastern Georgia and all of South Carolina, the thickness of the Oligocene Series only locally exceeds 100 ft and is generally 50 ft or less.

SUWANNEE LIMESTONE AND EQUIVALENT BOCKS

The name "Suwannee Limestone" was proposed by Cooke and Mansfield (1936, p. 71) for "yellowish limestone typically exposed along the Suwannee River in Florida, from Ellaville...almost to White Springs.... They considered these beds to be of Oligocene (Vicksburgian) age rather than Miocene as previous investigators had postulated. Cores and well cuttings examined during this study show that the Suwannee usually consists of two rock types: (1) cream to tan. crystalline, highly vuggy limestone containing prominent gastropod and pelecypod casts and molds and (2) white to cream, finely pelletal limestone containing small foraminifers and pellets of micrite bound by a micritic to finely crystalline limestone matrix. Although these two rock types are complexly interbedded in places, the pelecypod cast-and-mold limestone is more characteristic of the upper part of the Suwannee and is the lithology most representative of the entire formation in most of Georgia and eastern panhandle Florida. The micritic pelletal limestone that is characteristic of the lower part of the Suwannee is locally

found higher in the formation in southwestern Florida. Because the Suwannee, like the Ocala, cannot be divided everywhere, the two facies have not been delineated in this report.

The upper part of the Suwannee has been locally silicified, and this chert-rich horizon was named the Flint River Formation in Georgia. These silicified beds are rarely found in the subsurface and appear to merely represent local diagenetic conditions rather than a widespread mappable variation within the Suwannee. The term Flint River is accordingly not considered to be a valid formational name in this report.

The upper part of the Suwannee in the Georgia subsurface commonly consists of medium to coarsely crystalline, light-brown to honey-colored, saccharoidal, vuggy dolomite. The erosional remnants of Suwannee preserved as outliers several miles distant from the main bodies of Oligocene rocks (pl. 10) and consisting of either limestone or dolomite show that marine Oligocene strata once covered the entire study area. Locally, the cast-and-mold facies of the Suwannee contains fine-grained sand. Very locally, the micritic pelletal facies contains trace amounts of fine- to medium-grained, light- to dark-brown phosphate. In outcrop, the Suwannee locally weathers to a nodular, rubbly surface owing to the removal of layers, lenses, and stringers of soft argillaceous limestone.

The Suwannee grades northward in northeastern Georgia and South Carolina into part of the Cooper Formation by the addition of clay and sand and the loss of limestone. Westward, across panhandle Florida and southern Alabama, the Suwannee appears to grade into the lower part of the Bucatunna Formation. In that area, the Suwannee consists of tan limestone, dolomitic limestone, and light-colored calcareous clay. Some of these beds were called "Byram" or "Glendon" by early workers (Cooke and Mossum, 1929; Cooke, 1945) primarily on the basis of their stratigraphic position. Some faunal aspects of the Suwannee in Florida are Chickasawhayan (late Oligocene): others are Vicksburgian tearly Oligocene). The unit is thus interpreted in this report as spanning both ages (pl. 2). The Suwannee in Georgia is thought to be late Oligocene (Huddlestun, 1981).

Microtauna considered characteristic of the Suwannee include the larger Foraminifera Lepidocyclina leonensis Cole and L. parvula Cole as well as the small Foraminifera Pararotalia byramensis Cushman and P. mexicana mecatepecensis Nutall, which are closely related. Although the genus Miogypsina ranges into younger strata in the central Gulf Coast, it does not occur above the top of the Suwannee in the study area. The larger Foraminifera Discornopsis gunteri Cole. Dictyoconus cookei (Moberg), and Coscinolina floridana Cole are commonly found in the Suwannee.

but these three species are also found lower in the section in the middle Eocene Avon Park Formation. Some authors think that these species have been reworked from the Avon Park into the Suwannee. Others think that they are merely long-ranging species that are "facies seekers." That is, their reappearance in the Suwannee means nothing more than the reestablishment of environmental conditions like those in which the Avon Park was deposited. Most individuals of these three species from the Suwannee examined during this study appeared fresh and unaltered, and the species are widespread throughout the cast-andmold facies of the formation. In addition, there is no apparent Avon Park source from which these fossils could have been reworked. The isolated patches of Avon Park that are exposed through a cover of upper Eocene sediments (pl. 8) are too small and too scattered to provide a source from which these widely distributed Foraminifera could have been reworked into the Suwannee. This author therefore believes that these are long-ranging species indigenous to the Suwannee Limestone.

BUMPNOSE, RED BLUFF, AND FOREST HILL FORMATIONS

In panhandle Florida, the Oligocene Series thickens considerably (pl. 11) and becomes increasingly clastic westward. In addition, some carbonate units that are older than the Suwannee are present at the base of the Oligocene (pl. 2). One such unit is the Bumpnose Formation, a name applied by Moore (1955) to a soft. white, somewhat glauconitic, highly fossiliferous (peleeypod and gastropod casts and molds and bryozoan and foraminiferal remains) limestone that crops out in central Jackson County, Fla. Moore thought that the Bumphose represented the uppermost part of the late Eocene but recognized that many of its faunal elements were Oligocene. Subsequent work by Hazel and others (1980) confirmed the findings of MacNeil (1944) and Cooke iquoted by Moore, 1955, p. 38) that the beds that Moore called Bumphose correlate with the Red Bluff Formation of Alabama of known Oligocene age. The Bumpnose in its type area is very likely a transitional unit between the late Eocene and early Oligocene. The Bumpnose Formation, however, is placed in the Oligocene in this report because carbonate rocks in western Alabama that are in the same stratigraphic position as the Bumpnose and that can be shown to correlate with it are of Oligocene age (Hazel and others. 1980).

The Bumpnose grades northwestward into the Red Bluff Formation, which is mostly dark-gray to brown, fossiliferous, glauconitic clay that contains some iron-

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The Bumpnose grades northwestward into the Red Bluff Formation, which is mostly dark-gray to brown. fossiliferous, glauconitic clay that contains some iron-

UPPER CONFINING UNIT

Over much of the study area, the Floridan aquifer system is overlain by an upper confining unit that consists mostly of clastic rocks but locally contains much low-permeability limestone and dolomite in its lower parts. In places, the upper confining unit has been removed by erosion, and the Floridan either crops out or is covered by only a thin veneer of permeable sand that is part of the surficial aguifer. Because the lithology and thickness of the upper confining unit are highly variable, the unit retards the vertical movement of water between the surficial aquifer and the Floridan aquifer system in varying degrees. Where the upper confining unit is thick or where it contains much clay. leakance through the unit is much less than where it is thin or highly sandy. In these thick or clay-rich areas, therefore, water in the surficial aquifer moves mostly laterally and is discharged into surface-water bodies rather than moving downward through the upper confining unit (when the head differential is favorable) to recharge the Floridan aquifer system.

The upper confining unit may be breached locally by sinkholes and other openings that serve to connect the Floridan aquifer system directly with the surface. These sinkholes are for the most part found where the thickness of the upper confining unit is 100 ft or less. They appear to result from the collapse of a relatively thin cover of clastic materials into solution features developed in the underlying limestone of the Floridan aquifer system rather than from the solution of limestone beds within the upper confining unit itself. The upper confining unit is generally more sandy where it is less than 100 ft thick because these relatively thin areas represent upbasin depositional sites where coarser clastic rocks were laid down. Plate 25 shows the extent and thickness of the upper confining unit. The maximum measured thickness of the unit is about 1.890 ft in well ALA-BAL-30 in Baldwin County, Ala. The maximum contoured thickness is 1,900 ft. Plate 25 also shows areas where water in the Floridan aquifer system occurs under unconfined, thinly confined (thickness of upper confining unit between 0 and 100 ft), and confined conditions.

The upper confining unit includes all beds of late and middle Miocene age, where such beds are present. Locally, low-permeability beds of post-Miocene age are part of the upper confining unit. Over most of the study area, middle Miocene and younger strata consist of complexly interbedded, locally highly phosphatic sand, clay, and sandy clay beds, all of which are of low permeability in comparison with the underlying limestone of the Floridan aquifer system. Locally, low-permeability carbonate rocks that are part of the lower

Miocene Tampa Limestone or of the Oligocene Suwannee Limestone are included in the upper confining unit. Very locally, in the West Palm Beach, Fla., area, the uppermost beds of rocks of late Eocene age are of low permeability and are included in the upper confining unit.

Parker and others (1955) and Stringfield (1966) included basal beds of the Hawthorn Formation in their Floridan and principal artesian aquifers where those beds are permeable. In a few isolated cases (for example, in Brevard County, Fla.), the lowermost Hawthorn strata are indeed somewhat permeable, but their permeability is considerably less than that of the underlying Floridan aquifer system, as Parker and others (1955, p. 84) recognized. Locally, in parts of southwestern Florida (Sutcliffe, 1975; Boggess and O'Donnell, 1982) and west-central peninsular Florida (Ryder, 1982), permeable zones within the Hawthorn Formation are an important source of ground water over a one- or two-county area. Although some of these permeable zones are limestones, their transmissivity is at least an order of magnitude less than that of the Floridan aquifer system, and they are separated from the main body of permeable limestone (Floridan) by thick confining beds. Because of their limited areal extent, relatively low permeability, and vertical separation from the Floridan aquifer system practically everywhere, water-bearing Hawthorn limestones are excluded from the Floridan in this report.

Where the limestone and dolomite of the Floridan crop out, a clayey residuum may form over the carbanate rocks as a result of chemical weathering that dissolves the carbonate minerals and concentrates trace amounts of clay that are in them. Such residumm is particularly well developed in the Dougherty Plain area of southwestern Georgia (Hayes and others, 1983). Although this residuum is a low-permeability material and may very locally form a semiconfining layer above the limestone, it is usually thin and laterally discontinuous. Accordingly, the clayey residuum is not included in this report as part of the upper confining unit of the Floridan aquifer system.

Because the rocks that comprise the upper confining unit vary greatly in lithology, are complexly interbedded, and for the most part are of low permeability. little is known about their hydraulic characteristics. Where clay beds are found in the Hawthorn Formation, they are usually very effective confining beds. Vertical hydraulic conductivity values for Hawthorn clays, as established from core analysis and from aquifer tests, range from 1.5×10^{-2} ft/d (Hayes, 1979) to 7.8×10^{-7} ft/d (Miller and others, 1978). Where sandy beds of the Hawthorn comprise a local aquifer, transmissivity values for the sand range as high as



Southwest Florida Water Managemen

REFERENCE 19

2379 Broad Street (U.S. 41 South) Brooksville, Flc Phone (904) 796-7211 or 1-800-423-1476 SUNCOM 628-4150

Charles A. Black

Chairman Crystal River Roy G. Harrell, Jr. Vice Chairman St Petersburg Anne Bishopric Soger Secretary Venice Joseph S. Casper Treasurer, "ampa Mary Ann Hogan Brooksville Samuel D. Updike Lake Water Gordon D. Hartman Bradenton David H. Knowiton St Perensourg Andrew J. Lubrano

Tampa
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New Fort Richev
Sally Thompson
Tampa

Peter G. Hubbell Executive Director Mark D. Farrell Assistant Executive Director Kent A. Zalser General Counse September 27, 1990

Ms. Maureen M. Gordon NUS. Corporation 1927 Lakeside Pkwy., Suite 614 Tucker, Georgia 30084

SUBJECT: Well Construction Permit Listing

Dear Ms. Gordon

Enclosed you will find copies of the above referenced listing for the areas outlined in your letter dated September 6, 1990.

If I can be of any further assistance, please contact this office.

Sincerely

JAMES P. MARSHALL Well Construction Permit Coordinator

/JPM



1927 LAKESIDE PARKWAY SUITE 814 TUCKER, GEORGIA 30084 404-938-7710

C-586-9-0-55

September 6, 1990

Mr. Jim Marshal 2379 Brood Street Brooksville, FL 34609-6899

Dear Mr. Marshal:

I am doing a site investigation of AMAX Phosphate Facility (Royster) in Palmetto for Superfund. Could you please send me a listing of all wells (private, municipal, industrial) within a 4-mile radius. The latitude of the site is 27°37′24" and the longitude, 82°31′54′. The following is a listing of Sections, Townships, and Ranges included in the 4-mile radius:

Approved:

Sections 13-36, Township 32S, Range 18E Sections 1-36, Township 33S, Range 18E Sections 1, 12, 13, 23-27, 34, 35, Township 33S, Range 17E

Very truly yours,

Maureen M. Gordon, Ph.D.

Maurece Lordo

Project Manager

MMG/tb

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DATE 9/27/90 5:02:12 SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT 5 PAGE WELL CONSTRUCTION PERMITTING PERHIT SUMMARY FROM: 00/00/00 TO 99/99/99 RDBON55 5:13 - 36 T:32 R:18 DEPTH: O TO 9999 DIAMETER: O TO 99 METHOD: USE: CASE DEPTH: BY: COUNTY: TAE ATV O NA H TEE R LOCATION I CASE WELL U HG O IRL A O O L U LICH S 1 A DEPH DEPH T RS D PERMIT S NUMBER F 000 STR USER-ID LOT OWNER NAME 386212 C 1336 O 11 057 2 4 243218 90 220 N C C nagaga COMBS, HELEN F. 92 216 N O C 389662 C 1336 D 11 057 O 0 243218 000000 22 NO BEATTIE, MARVIN 389663 C 1336 D 11 057 0 0 243218 230 N 000000 NO BOYLER. EDWARD 421239 I 1336 D 11 057 3 1 243218 87 243 0.0 0000 WALLACE. JOHNNY 378648 E 1477 D 11 057 O 0 243218 96 200 N пс LOTBEC NO LARGE. FRANK 382852 C 2C88 P 11 057 D 0 243218 67 250 N u c cocooo NO THOMAS, PAUL 384713 E 1477 D 11 057 4 2 243218 220 N LOT-14 96 0 C NO KLINGENSHITH, RLAPH L. 386968 C 2088 D 11 057 O 0 243218 94 245 N 0 C 000000 NO LEE. MAX 000000 388488 C 2088 D 11 057 D 0 243218 240 N 0 C NO GONEZ, FRANK 386752 C 2688 D 11 057 D 0 243218 205 N 0.0 10 ra0000 NO SMITH, ED A บอออกอ 388753 C 2G88 D 11 057 D D 243218 83 200 N 0 C NO SMITH. ED A 389270 C 2088 D 11 057 0 0 243218 74 200 N 3 C 000000 SMITH, ED A NO 397110 C 2088 D 11 057 O 0 243218 203 N 000000 NO CAVAZOS, PEDRO 4G1012 C 2C88 D 11 057 O 0 243218 86 230 N 0 C 30 000000 NO SMITH, ED 409598 E 1477 D 11 057 0 0 243218 220 0 C L 10611 MO MARSELL, GERALD A & CAROLYN 409591 E 1477 D :1 057 O 0 243218 250 N 0 C LOT 23 NO MARSELL, GERALD A & CAROLYN R 000000 4C4927 E 2267 D 11 057 1 4 243218 345 N NO B. W. ELSBERRY TOMATO FARM 411224 E 1336 D 11 057 2 4 243218 75 230 N n c LOT 10 NO. MAGIENA. JOSEPH 918501 I 2C88 Ď 11 057 0 0 243218 63 275 N ÔĈ 0000 SHITH, ED NO 420882 I 1477 D 11 057 0 0 243218 110 200 0005 NO MARSELL, JERRY 421240 I 1336 D 11 057 2 1 243218 73 220 0.0 0000 NO COLPEAN, DON MARSELL. JERRY 423673 I 1477 D 11 057 O 0 243218 120 220 n c 0012 0000 DEPT OF TRANSPORTATION 429163 I 1477 D 11 057 1 1 243218 80 180 U C NO 120 0018 NO DEPT OF TRANSPORATION 429991 I 1477 D 11 057 1 1 243218 85 0 C 432250 I 2088 D 11 057 0 0 243218 120 260 0000 NO DITIOLT, LEON 433410 T 1477 D 11 057 3 1 243218 4 107 246 0 C 0000 NO CARDOSO, HENRY 0000 WEAVER. DAVID 460523 I 1477 D 11 057 O 0 243218 0000 REGIS, ARLEN 496158 I 2088 D :1 057 D 0 243218 320 NO 0000 NO WEAVER, DAVID 178 Y 39 R 15 490699 I 1627 D 14 057 0 0 243218 5 122 NO H SCHAUBE 326391 E 1336 D 11 057 0 0 243218 189 O C 17 49081C I 1336 H 11 057 1 3 243218 100 210 0000 MO RODRIGUEZ, JOSE G. 0000 MOORINGS OF MANATEE 0 11 057 0 0 243218 NO 50D894 I 2825 12 Y 1 A MOORINGS OF MANATES 500895 I 2825 11 057 0 0 243218 12 0000 NO 0000 NO MOORINGS OF MANATEE 500896 I 2825 0 11 057 0 0 243218 12 Y MOORINGS OF MANATEE 0000 5Cu897 I 2825 0 11 057 0 0 243218 12 Y N O 0 11 057 0 0 243218 0000 MOORINGS OF MANATEE 506848 I 2875 12 Y NO 0000 NO MOORINGS OF MANATEE 0 11 057 0 0 243218 12 Y 500899 1 2825 MOORINGS OF MANATEE 0000 NO 502350 I 2825 0 11 057 0 0 243218 MOORINGS OF MANATEE 502353 J 2825 O 11 057 D 0 243218 12 Y 1 A 0000 NO.

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DATE 9/27/90 5:16:39 SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT WELL CONSTRUCTION PERMITTING ROBOOSS PERMIT SUMMARY FROM: 00/00/00 TO 99/99/99 BY: COUNTY: 5: 1 - 36 T:33 R:18 DEPTH: 0 TO 9999 DIAMETER: 0 TO 99 METHOD: USE: CASE DEPTH: M SWL S TAE PC B T ATY CL T DRILL U TEE LOCATION U LICH S 1 I CASE WELL U BG O IRL A O 0 L Y QQQ STR A DEPH TERM C PRNF USER-ID LOT H OWNER NAME 0000No.... 445151 1 1051 A 21 081 0 0 023318 33]18 O C TOPEUN H.G. 4356U6 N 2987 0 21 081 0 0 023318 2 *** CANCELLED *** ELSBERRY INC. 435607 N 2987 0 11 081 0 0 023318 2 *** CANCELLED *** ELSBERRY INC. 4356C8 N 2987 0 21 081 0 0 023318 2 *** CANCELLED *** ELSBERRY INC. 4356L9 N 2987 0 21 081 D 0 023316 2 *** CANCELLED *** ELSBERRY INC. 47U119 N 2CR8 A 21 081 0 0 033318 4 *** CANCELLED *** EZSBERRY, BRUCE 449330 I 1376 I 21 081 0 0 053318 0000 12 105 610 0 C CANNON, HARRY 449332 I 1376 I 21 Q81 Q Q 053318 12 310 600 0000 NO CONSOLIDATED MINERAL INC. 700627 C 2073 T 21 081 0 0 053318 USGS 447428 I 1360 A 21 081 0 0 063318 Curo 32 100 LOGGINS, CORBIN NO 448625 1 1627 A 21 081 9 0 063318 DEPARTMENT OF NATURAL RESOURCES 92 370 Y 25 R 0000 448875 N 2684 0 21 081 3 0 063318 2 *** CANCELLED *** MANATEE CO. FACILITIES MGMT. 448876 N 2884 0 21 081 0 0 063318 MANATEE CO. FACILITIES MGMT. 2 *** CANCELLED *** 448879 N 2884 O 21 081 0 0 063318 2 *** CANCELLED *** MANATEE CO FACLILTIES MEMT. MANATEE CO. FACILITIES MEMT. 448880 N 2884 0 21 081 0 0 063318 *** CANCELLED *** 464170 1 2884 0 21 081 0 0 063318 0000 MANATEE CO.FACILITIES MANAGE. 20 Y 1 A 374340 C 0[0] T 21 081 0 0 063318 15 22 N D C TF1531 TAMPA ELECTRIC CO NO 77-391 3CL585 C 1627 A 21 081 0 0 073318 SUN DC NO BARCO, W. S. ..0..5.. NICHOLS. DR FRED 300037 C 1627 A 21 081 0 0 073318 390 N 12 76-090 NO 0000 SWITZER, MOREY(STARLITE CONST.) 448361 I 1627 A 21 081 0 0 073318 63 260 Y 14 R NO ROYSTER. CORP. 469980 I 9033 A 21 081 0 0 073310 0 38 Y 5 R 0000 NO 448698 N 2858 0 21 081 0 0 073318 2 *** CANCELLED *** COMMERCIAL CARRIER CORP. COMMERCIAL CARRIER CORP. 448699 N 2858 O 21 081 0 0 073318 2 *** CANCELLED *** 44876C N 2858 0 21 081 0 N 073318 2 *** CANCELLED *** COMMERCIAL CARRIER CORP. 2 *** CANCELLED *** COMMERCIAL CARRIER CORP. 448701 N 2858 0 21 081 0 0 073318 FLORIDA POWER CORPORATION 449666 I 2406 0 21 081 0 0 073318 FLORIDA POWER CORPORATION 449667 I 24D6 0 21 081 0 0 073318 FLORIDA POWER CORPORATION 449668 1 2476 0 21 081 3 0 073318 FLORIDA POWER CORPORATION 449669 I 2406 0 21 081 0 0 073318 COCO NO ROYSTER COMPANY 476227 1 9633 0 21 081 0 0 073318 DAVIS HOYT 445134 I 1627 A 21 081 0 0 083318 COCHRAN, ELBERT LEE 700356 C 1627 D 21 081 0 0 083318 AUSTIN, BOB 701148 C 1613 D 21 081 0 0 083318 AMAX CHEMICAL CORP. 44E357 N 2372 0 21 081 0 0 083318 4 *** CANCELLED *** USGS 700628 C 2673 T 21 081 0 0 083318 USGS 700629 C 2073 T 21 981 0 0 083318 **US65** 700630 C 2073 T 21 081 0 0 083318 uses 700841 C 2C73 T 21 081 0 0 083318 REEDE RANCH 449237 I 1376 A 21 081 0 0 093318 10 340 815

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DATE 9/27/90 5:16:39 SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT PAGE WELL CONSTRUCTION PERMITTING RCBON55 PERMIT SUMMARY FROM: 00/00/00 TO 99/99/99 S: 1 - 36 T:33 R:18 DEPTH: O TO 9999 DIAMETER: O TO 99 METHOD: USE: CASE DEPTH: BY: COUNTY: SWL S TAE BT ATV TEE CL DRILL U 1 CASE WELL U BG O IRL 0 L A O PERMIT S NUMBR 5 QQQ STR A DEPH DEPH T RS D C PRNF USER-ID LOT 4 *** CANCELLED *** 21 081 0 0 303318 ADAMS. DURAND J. 247081 N 1376 D 701204 C 1627 D 21 081 D 0 303318 HOWELL, ERNEST 449171 1 2831 D 21 081 0 0 303318 ROBERTSON, KENNETH ' E 21 081 0 0 3U3318 GENERAL ASPHALT CO OF BRADENTON 700805 C 1627 4453U2 N 1979 O 21 081 J O 303318 6 *** CANCELLED *** SWEWND 4453 <u>1 1 1979 0 21 081 0 0 303318</u> 236 321 O R SWFWMD 4453U4 I 1979 0 21 081 0 0 303318 8 1047 1260 Y 65 R 0000 SUFUND 8 *** CANCELLED *** 448222 N 1276 O 21 081 D O 303318 SWEWND 447756 N 2502 Y 21 081 D 0 303318 *** CANCELLED *** TIPE LAKE R.V. 760886 C 1651 A 21 081 0 0 313318 LAURENT. H. S. 700899 C 1L51 A 21 081 0 0 313316 LEGRANGE, W. A. 4471,8 N 1051 D 21 081 3 3 313318 4 *** CANCELLED *** LAWRENCE - DUCKWORTH 700851 C 1651 D 21 081 0 0 313318 YANKEE, ROBERT 120 200 Y 18 R 0000 447965 1 1376 D 21 081 D 0 313318 FIRST CHURCH OF GOD 0000 ROYAL CROWN BOTTLING CO. 470294 1 2987 0 21 081 0 0 313318 15 Y 2 A NO 476295 I 2987 0 21 081 0 0 313318 COCO ROYAL CROWN BOTTLING CO. 15 Y 2 A NO 0000 ROYAL CROWN BOTTLING CO. 470296 I 2987 0 21 C81 3 0 313318 2 15 Y 2 A NO 476297 I 2987 0 21 081 0 0 313316 2 15 Y 2 A 0000 NO ROYAL CROWN BOTTLING CO. 701053 6 1627 2 21 081 0 0 313318 CHAUNCEY. JERRY 700674 C 1627 A 21 081 0 0 323318 BOWEN FAHILY TRUST 449462 I 1627 A 21 081 0 0 323318 0000 DAKIN, SHERBURN CREATIVE GROWERS, INC. 7CU696 C 1627 A 21 081 3 0 323318 76-005 NO HUGHES, C. E. & EDWARDS, LEE 30L006 C 1627 D 21 081 0 0 323318 190 N O C 19 NO HUGHES, CURTIS W. 300006 C 1627 D 21 081 0 C 323318 190 N 0 C 19 A O 0000 ARNESON T49388 1"2670" A "21 081 0 0"3433'18 90 205 0 C 18 NO 5 199 440 Y 55 R Ω 0000 NO ARMSTRONG, MIKE 447189 I 1627 A 21 Q81 Q Q 343318 445768 I 1627 A 21 081 0 0 353318 15 0000 MASTERS HERCHANDISE MART 41 344 Y 5 R POWELL, JACK 446766 N 1C51 A 21 081 0 0 353318 CHADSEY. TAYLOR 701093 C 1627 A 21 081 0 0 353318 CHADSEY JR., TAYLOR B. 7Ci162 C 1627 A 21 081 0 0 353318 464078 1 2587 0 21 081 3 0 363318 UNION 76 UNION 76 464080 I 2587 0 21 081 0 0 363318 UNION 76 464 082 I 2587 0 21 081 0 0 363318 UNION 76 464084 1 2587 0 21 081 3 0 363318

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DATE 9/27/90 5:58:15 SOUTHWEST FLORIDA WATER HANAGEHENY DISTRICT WELL CONSTRUCTION PERMITTING RDBON55 PERHIT SUMMARY FROM: 00/00/00 TO 99/99/99 5:43 - 27 1:33 R:17 DEPTH: 0 TO 9999 DIAMETER: 0 TO 99 METHOD: USE: CASE DEPTH: by: COUNTY: RASIN: SWL E TAE P'C R B T ATV O NA H TEE CL 0 U LICH S I CASE JELL U RG O TRL LOCATION ÃO PERMIT S NUMBE F OGO STR A DEPH TEPH T RS D N F USER-ID LOT OWNER NAME 300522 C 1627 D 21 081 D 0 243317 Q C B 77-293 62 180 N D C NO HARLLEE, ELLA 700580 C 1627 21 081 0 0 243317 FAITH OF DELIVERENCE CHURCH 464289 I 1376 D 21 081 D D 243317 0000 NO GAY. RONALD L. 42 160 0 0 387964 C 7263 4 15 053 0 0 253317 000000 119 N O C NO MR. WHITACRE 945028 I 1627 4 21 081 0 0 253317 3.7 175 n c 0000 NO GLASS HARRY / WALLACE JAMES 2 G 446618 1 1013 21 081 0 0 253317 30 130 0000 NO MARTIN JACK 448108 1 1051 A 21 081 0 0 253317 40 115 0000 WOODSON. BILL CC NO 76-323 300133 C 1627 0 21 081 0 0 253317 68 230 N O T NO UNDERWOOD. W. R. 445700 N 1376 D 21 081 0 0 253317 *** CANCELLED *** BENJAMIN GEORGE 301507 E 1627 N 21 981 9 0 263317 3 300 300 TERRA C BAP 37 100 U C 10 NO 302843 C 1627 9 21 081 9 0 263317 65 125 N n C M79-14 NO DUNBAR. ROOSEVELT AH C B 7CU133 C 1627 D 21 081 0 0 263317 TERRA CEIA BAPTIST CHURCH 302907 C 1627 P 21 081 D 0 263317 37 122 N 0 T RCB 79-129 NO MANATEE DAY CARE CENTER 700375 C 1627 D 21 081 O 0 273317 CAMPBELL. DONALD MULBERRY DAVE 21 781 0 0 273317 0000 NO 445766 I 1627 D 262 328 Y 49 R 448866 T 2831 C 21 081 0 0 273317 24C Y 18 R 0000 HODGER. DEBBIE NO MC CLANATHAN, MICHAEL 448887 I 1627 D 21 091 3 D 273317 87 300 Y 21 R 0000 NO GRANT III, JAMES T. 471217 1 1627 0 21 981 3 0 273317 3CC Y 49 R 0000 NO 447228 1 2251 Y 21 081 0 0 273317 100 0000 NO MIXON. WILLIAM D.

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B&V WASTE SCIENCE AND TECHNOLOGY CORP.

TELEPHONE MEMORANDUM

Site Assessment AMAX Phosphate Facility

Water Distribution System

BVWST Project 52012.065 BVWST File E.1 July 14, 1992 2:45 p.m.

To:

Supervisor

Company:

Mnatee County Water Department

Phone No.:

(813) 792-8811

Recorded by: Eric Holder

Eric Holder Elf 9/16/92

All of Manatee County is served by Manatee County Water Department except the City of Bradington.

Manatee County gets its water solely from intakes on Lake Manatee.

Manatee County Water Department serves 51,660 people.

There are 5,196 people in the county not served by the water department. It is assumed that they get their water from private wells.

B&V WASTE SCIENCE AND TECHNOLOGY CORP.

Reference 21

TELEPHONE MEMORANDUM

Site Assessment AMAX Phosphate Facility BVWST Project 52012.065 BVWST File E.1 July 14, 1992 3:15 p.m.

Water Distribution System

To:

Allen Kouvarez

Company:

Hillsborough County Water Department

Phone No.:

(813) 272-5977

Recorded by: Eric Holder EM 4/16/92

The whole area north of Southern Hillsboro County line to four-mile radius is served by private wells in Hillsborough County.

The Water Department does not service any area along the coast south of Gulf City.

Table 6. Household, Family, and Group Quarters Characteristics: 1990

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SUMMARY POPULATION AND HOUSING CHARACTERISTICS

FLORIDA 79

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NOTE: The population counts set forth herein are subject to possible correction for undercount or overcount. The United States Department of Commerce is considering whether to correct these counts and will publish corrected counts, if any, not later than July 15, 1991.

NATIONAL FLOOD INSURANCE PROGRAM

FIRM -

FLOOD INSURANCE RATE MAP

MANATEE COUNTY, FLORIDA

(UNINCORPORATED AREAS)

PANEL 19 OF 550
(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER 120153 0019 B

> MAP REVISED: MARCH 15, 1984

Federal Emergency Management Agency

NATION & FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

MANATEE COUNTY, FLORIDA

(UNINCORPORATED AREAS)

PANEL 18 OF 550
(SEE MAP INDEX FOR PANELS NOT PRINTED

COMMUNITY-PANEL NUMBER 120153 0018 B

> MAP REVISED: MARCH 15, 1984

Federal Emergency Management Agency





FIRM
FLOOD INSURANCE RATE MAP

MANATEE COUNTY, FLORIDA (UNINCORPORATED AREAS)

PANEL 182 OF 550
(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER 120153 0182 B

> MAP REVISED: MARCH 15, 1984



Federal Emergency Management Agency

KEY TO MAP

		•
500-Year	Flood Boundary ———	TEST STATUS TO SE
100-Year	Flood Boundary ————	
	gnations* With entification 74	
100-Year	Flood Boundary	2000 AND 2000
500-Year	Flood Boundary	Self-design of the French Con-
	d Elevation Line ation in Feet**	513
	d Elevation in Feet iform Within Zone**	(EL 987)
Elevation	Reference Mark	RM7 _×
Zone D Bo	oundary————	
River Mile		•M1.5
**Referen	ced to the National Geodetic	Vertical Datum of 1929
*EXPI	ANATION OF ZONE	DESIGNATIONS
ZONE	EXPLANA	TION
A	Areas of 100-year flood; flood hazard factors not de	base flood elevations and termined.
Α0	Areas of 100-year shallo are between one (1) and the of inundation are shown, bare determined.	w flooding where depths ree (3) feet; average depths ut no flood hazard factors
АН	Areas of 100-year shallor are between one (1) and elevations are shown, but are determined.	w flooding where depths three (3) feet; base flood no flood hazard factors
A1-A30	Areas of 100-year flood; flood hazard factors determ	
A99	Areas of 100-year flood protection system under elevations and flood hazar	construction; base flood
В	Areas between limits of th year flood; or certain areas ing with average depths less the contributing drainage a mile; or areas protected by (Medium shading)	subject to 100-year flood- than one (1) foot or where rea is less than one square

NOTES TO USER

Areas of minimal flooding. (No shading)

not determined.

determined.

Areas of undetermined, but possible, flood hazards. Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors

Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors

C

V1.V30

Certain areas not in the special flood hazard areas (zones A and V) may be protected by flood control structures.

This map is for flood insurance purposes only; it does not necessarily show all areas subject to flooding in the community or all planimetric features outside special flood hazard areas.

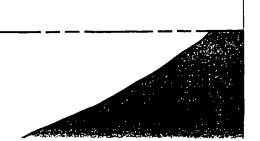
For adjoining map panels, see separately printed index To Map Panels.

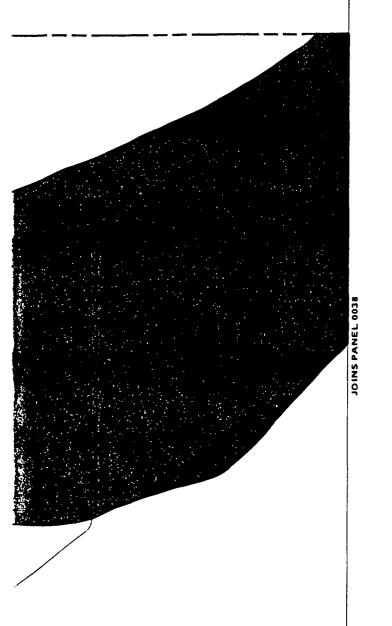
Coastal base flood elevations apply only landward of the shoreline shown on this map.

Coastal base flood elevations shown on this map include the effects of wave action.

INITIAL IDENTIFICATION: JUNE 26, 1971

FLOOD HAZARD BOUNDARY MAP REVISIONS:





may be protected by flood control structures.

This map is for flood insurance purposes only; it does not necessarily show all areas subject to flooding in the community or all planimetric features outside special flood hazard areas.

For adjoining map panels, see separately printed Index To Map Panels.

Coastal base flood elevations apply only landward of the shoreline shown on this map.

Coastal base flood elevations shown on this map include the effects of wave action.

INITIAL IDENTIFICATION: JUNE 26, 1971

FLOOD HAZARD BOUNDARY MAP REVISIONS:

FLOOD INSURANCE RATE MAP EFFECTIVE:
JUNE 26, 1971

FLOOD INSURANCE RATE MAP REVISIONS:
Interim map revision July 1, 1974 to change zone designations.

Map revised February 20, 1976 to reflect curvilinear boundary and to show changes in base flood elevations.

Map revised March 15, 1984 to change zone designations and base flood elevations reflecting wave action effects, and to change special flood hazard areas, base flood elevations, zone designations and corporate limits.

To determine if flood insurance is available in this community, contact your insurance agent, or call the National Flood Insurance Program, at (800) 638-6620.



APPROXIMATE SCALE

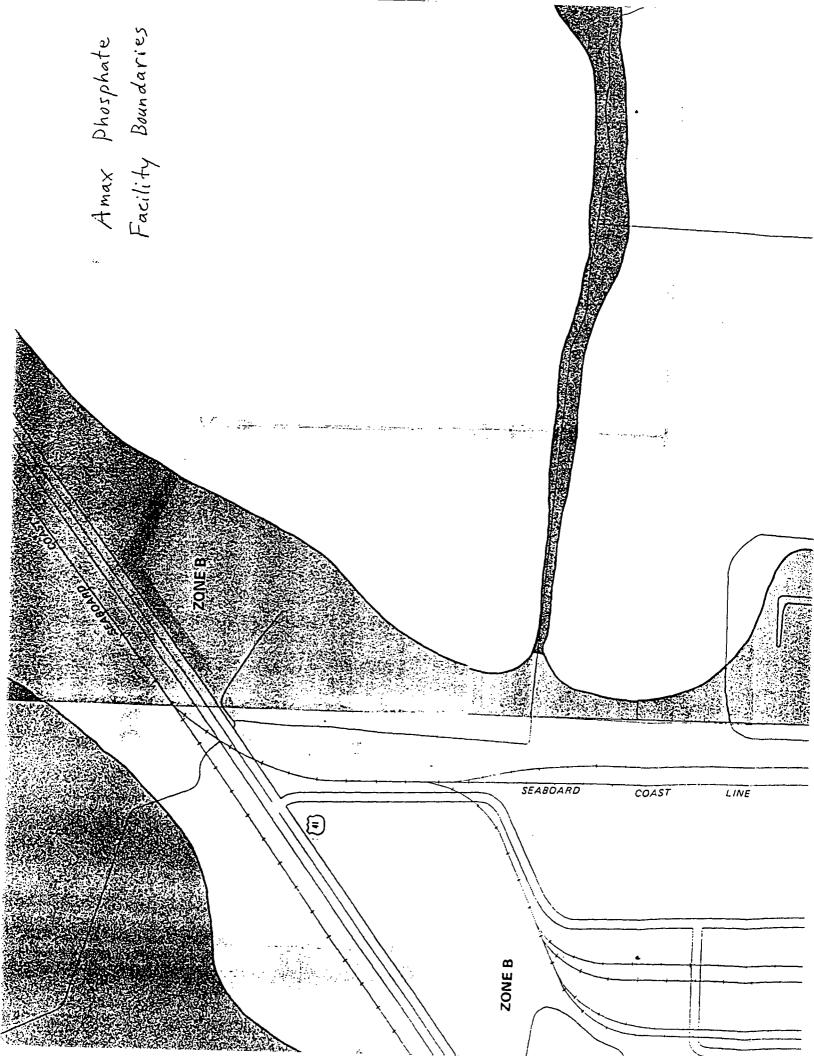
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NATIONAL FLOOD INSURANCE PROGRAM



FIRM
FLOOD INSURANCE RATE MAP





LEVEL

NOTEBOOK NO. 311

AMAX Phosphate.
TDD: F4-9009-01
Palmetto, Manatre Courty,
Florida

LOGBOOK REQUIREMENTS REVISED - NOVEMBER 29, 1988

NOTE: ALL LANGUAGE SHOULD BE FACTUAL AND OBJECTIVE

- Record on front cover of the Logbook: TDD No , Site Name, Site Location, Project Manager.
- 2 All entries are made using ink. Draw a single line through errors. Initial and date corrections.
- 3 Statement of Work Plan, Study Plan, and Safety Plan discussion and distribution to field team with team members' signatures.
- Record weather conditions and general site information
- 5 Sign and date each page. Project Manager is to review and sign off on each logbook daily.
- 6 Document all calibration and pre-operational checks of equipment. Provide serial numbers of equipment used onsite.
- Provide reference to Sampling Field Sheets for detailed sampling information.
- Describe sampling locations in <u>detail</u> and document all changes from project planning documents.
- 9 Provide a site sketch with sample locations and photolocations.
- Maintain photo log by completing the stamped information at the end of the logbook.
- 11 If no site representative is on hand to accept the receipt for samples, an entry to that effect must be placed in the logbook.
- Record I D. numbers of COC and receipt for sample forms used. Also record numbers of destroyed documents
- 13. Complete SMO information in the space provided

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U.S. EPA REGION IV

SDMS

Unscannable Material Target Sheet

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COVERAGE

Reference 25

STATE	COUNTY	STATE NAME	COUNTY NAME
12	57	Florida	Hillsborough Co
12	81	Florida	Manatee Co
12	103	Florida	Pinellas Co

CENTER POINT AT STATE : 12 Florida

COUNTY: 81 Manatee Co

Press RETURN key to continue...

REGION OF THE COUNTRY

Zipcode found: 33591 at a distance of 6.6 Km

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CENSUS DATA

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FINAL REPORT

SITE INSPECTION

AMAX PHOSPHATE FACILITY

PALMETTO, MANATEE COUNTY, FLORIDA

EPA ID #: FLD043055151

Prepared Under TDD No. F4-9009-01 Contract No. 68-01-7346

Revision 0

FOR THE

WASTE MANAGEMENT DIVISION
U.S. ENVIRONMENTAL PROTECTION AGENCY

JUNE 24, 1991

HALLIBURTON NUS ENVIRONMENTAL CORPORATION SUPERFUND DIVISION

Prepared By

Deborah Kristiansen for Maureen M. Gordon, Ph.D. Project Manager **Reviewed By**

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Assistant Regional
Project Manager and
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Phil Blackwell Regional Project Manager

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Regional Project Manager

NOTICE

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EXECUTIVE SUMMARY

The AMAX Phosphate Facility is located on approximately 670 acres, 6 miles north of Palmetto, Manatee County, Florida. Operations began at this facility in 1966. Currently, it is owned and operated by Royster Phosphates, Inc. Phosphate ore is transported to the facility, where it is converted to phosphoric acid and diammonium phosphate. Along with a gypsum/cooling pond complex, AMAX consists of sulfuric acid, phosphoric acid, and ammoniated fertilizer plants.

The potential for pollution of air and water are inherent in the production and use of fertilizers. The plant's process water has a low pH with a high concentration of inorganic by-products. In addition to high levels of radioactive particle emissions (including mostly uranium-236, uranium-238, radium-226), there are also elevated concentrations of arsenic, cadmium, chromium, lead, sodium, fluoride, manganese, iron, sulfate, and total dissolved particles. Also, air contamination from escaping dust and fumes from the plant's stacks can transmit airborne particulate pollutants and by-products. Additionally, the low pH of the process water causes the reaction of acid with fluoride impurities to produce gaseous hydrogen fluoride.

AMAX Phosphate is located in the Gulf Central Lowlands subdivision of the Atlantic (Gulf) Coastal Plain physiographic province and the southeast coastal plain hydrogeologic setting in northwest Manatee County, Florida. The facility is underlain by Miocene to Recent undifferentiated surficial sands, sandy limestone, and shells. These undifferentiated surficial deposits are 1 to 35 feet thick with an average depth to groundwater of 4 to 10 feet below land surface. The Miocene Hawthorn Group underlies the surficial aquifer system and ranges from 1 to 35 feet to a total of 356 to 400 feet thick. This formation acts as an upper confining unit for the underlying Floridan Aquifer System, which is a continuous sequence of carbonate rocks of generally high permeability.

Within the 4-mile radius of the facility, a portion of the population obtains potable water from shallow private or community wells completed in the surficial aquifer. Groundwater is also used for irrigation of farms and groves.

Surface water run-off from the facility is directed to a ditch system surrounding the waste source areas. These ditches can empty into one of two canals on either the northern or southern portion of the property. Currently, only the northern one is used for discharge by the plant. These canals empty into creeks, and both eventually flow into Tampa Bay to complete surface water migration pathway. Additionally, the surrounding area is composed of a large number of wetlands which also accept

drainage from the site. Drainage from the wetlands flows into the Little Manatee River on the north and Tampa Bay on the west. The Manatee River also eventually empties into Tampa Bay. Fishing, boating, and bathing occur in these waters. Also, several state- or federally designated protected or endangered species have ranges in the area. In fact, there is a critical habitat for the endangered Florida manatee (<u>Trichechus manatus</u>) located 6.5 miles from AMAX. Since the plant is in a flood plain, there is also a potential threat from flooding during wet weather.

During this sampling investigation, 44 environmental samples were collected. These include soil, groundwater, sediment, and surface water samples. The only organic pollutants of concern detected in elevated quantities in soil were toluene and carbon disulfide. Carbon disulfide, a by-product in the sulfuric acid manufacturing process, was also found in one groundwater sample collected from an onsite monitoring well. No organic compounds of concern, which are associated with the processes at the plant, were found in either sediment or surface water samples.

A sample of newly deposited gypsum was analyzed. It contained the following metals: aluminum, barium, calcium, chromium, iron, lead, magnesium, manganese, nickel, selenium, and vanadium. Those inorganics of concern detected in elevated quantities in soil samples, and also found in the gypsum, were barium, cadmium, chromium, manganese, nickel, selenium, and vanadium. Only cadmium and manganese were detected in elevated quantities in one onsite groundwater sample. The primary EPA maximum contaminant level (MCL) for drinking water standards was exceeded for manganese in this sample. Although the quantity of arsenic was not elevated, the MCL was exceeded for it in one groundwater sample collected on site. Additionally, the secondary MCL for drinking water standards for iron (300ug/l) was exceeded in seven of the onsite groundwater samples.

Chromium, lead, and vanadium were detected in elevated quantities in a sediment sample collected from the drainage ditch, while the only surface water sample containing elevated amounts of inorganics, including cadmium, chromium, lead, manganese, nickel, and vanadium, was taken from the cooling pond. There was no evidence of migration of these contaminants along the surface water pathway.

Analysis for radioactive nuclides in soil samples revealed that the onsite soil sample contained an elevated amount of radium-226 but not radium-228. Also, the amount of this nuclide in the southern drainage pathway was more elevated than in the northern drainage pathway. Values of radium-226 and radium-228 were elevated for the gypsum sample. However, none of these values exceeded the National Council on Radiation Protection and Measurements (NCRP) maximum criteria for radium-226 deposition on agricultural land (40 pCi/g). For groundwater samples, the MCL for primary drinking water standards was exceeded for gross alpha particle activity (15 pCi/l) for the background

and one onsite surficial aquifer monitoring well sample. Additionally, the combined radium-226, radium-228 MCL (5 pCi/l) was also exceeded for these two samples. This value for radium-226 was exceeded for the surface water sample collected in the southern drainage pathway too. Unlike the organic and inorganic results, the elevated radium-226 values for the surface water and sediment samples collected in the southern drainage pathway indicate migration of this nuclide from AMAX along the surface water pathway.

Because of the targets associated with the four contaminant pathways and the elevated quantities of contaminants found at AMAX Phosphate, FIT 4 recommends that this site be evaluated using the HRS (effective March 14, 1991).

1.0 INTRODUCTION

The HALLIBURTON NUS Environmental Corporation Region 4 Field Investigation Team (FIT) was tasked by the U.S. Environmental Protection Agency (EPA), Waste Management Division to conduct a Site Inspection (SI) at the AMAX Phosphate Facility in Palmetto, Manatee County, Florida. The investigation was performed under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA). The task was performed to satisfy the requirements stated in Technical Directive Document (TDD) number F4-9009-01. The field investigation was conducted the week of October 16, 1990.

1.1 OBJECTIVES

The objectives of this inspection were to determine the nature of contaminants present at the site and to determine if a release of these substances has occurred or may occur. Further, this inspection sought to determine the possible pathways by which contamination could migrate from the site and the populations and environments it would potentially affect. Through these objectives, a recommendation was made regarding future activities at the site.

1.2 SCOPE OF WORK

The objectives were achieved through the completion of a number of specific tasks. These activities were to:

- Obtain and review relevant background materials.
- Obtain information on local water systems.
- Determine location of and distance to nearest potable well.
- Evaluate potentially affected populations and environments associated with the groundwater, surface water, air, and soil exposure pathways.

- Develop a site sketch, to scale.
- Collect environmental samples.

2.0 SITE CHARACTERIZATION

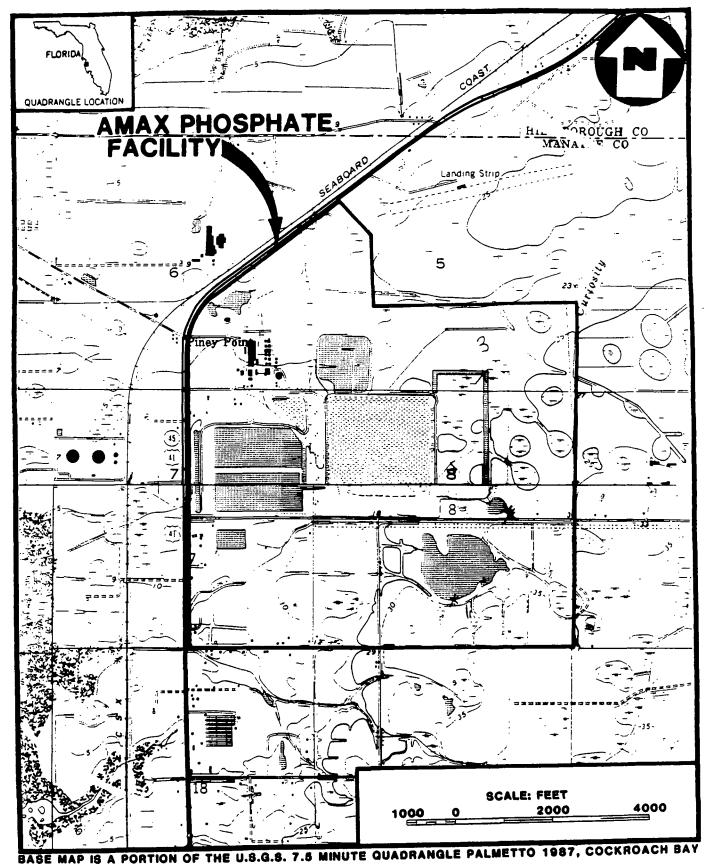
2.1 SITE HISTORY

The AMAX Phosphate Facility, Piney Point Complex site is located on approximately 670 acres, 6 miles north of Palmetto, in the northwestern corner of Manatee County, Florida (Appendix A). Phosphate ore is transported to AMAX, where it is converted to phosphoric acid and diammonium phosphate (DAP). This facility includes sulfuric acid, phosphoric acid, and ammoniated fertilizer plants along with a gypsum stack/cooling pond complex (Ref. 1). A site location map appears in Figure 1.

AMAX began operations at the facility in 1966 and expanded in 1978 (Ref. 1). It was then sold to Consolidated Minerals, Inc. of Plant City, Florida, at an unknown date, some time after February 1987 (Refs. 1, 2). At the end of 1988, Royster Phosphates, Inc. purchased the facility from Consolidated (Ref. 3). On November 1, 1990, Royster sold the plant to Atlantic Fertilizer Company as a joint venture with Gulf Atlantic; however, Royster is still responsible for the facility's management (Ref. 4).

The plant has been permitted by the Florida Department of Environmental Regulation (FDER) to discharge process and nonprocess wastewater into two drainage ditches. Outfalls 001 and 003, to the south of the facility, flow into a drainage ditch which empties into Bishop Harbor, an outlet to Tampa Bay, while Outfall 002, to the north, drains into a ditch which discharges into Piney Point Creek, then into Tampa Bay (Ref. 5). Outfalls 001 and 002 are for nonprocess water, while Outfall 003 is for treated process water. Outfall 001 was used for the last time in September 1989, and 003 was last used in March 1989. Presently, Outfall 002 is the only one used. All three outfalls are still permitted (Refs. 4, 6).

In 1982, a study was conducted by the U.S. Geological Survey on the effect of groundwater contamination in the area of gypsum stacks. The following contaminants were present in excess of primary drinking water standards at AMAX: silver, arsenic, chromium, cadmium, lead, fluoride, and selenium. Elevated levels of these inorganics in the groundwater extended to 50 feet beyond the stacks for silver, lead, fluoride, and selenium; to 200 feet for arsenic and cadmium; and to 300 feet for arsenic and cadmium; and to 300 feet for chromium (Ref. 1, p. 6, Tables 2, 3). Additionally, a groundwater monitoring plan was submitted to the FDER, Southwest District, in September 1983, and issued in September 1985, but was withdrawn in October 1985. After the company collected and submitted more information, the second permit was issued in March 1987. During this monitoring, groundwater quality problems, which include the following quantities exceeding primary drinking



BASE MAP IS A PORTION OF THE U.S.G.S. 7.5 MINUTE QUADRANGLE PALMETTO 1987, COCKROACH BASE 1981, FLORIDA.

SITE LOCATION MAP

FIGURE 1

SITE LOCATION MAP AMAX PHOSPHATE PALMETTO, MANATEE COUNTY, FLORIDA



water standards, were noted in 1988: sodium (180 mg/l), sulfate (745 mg/l), total dissolved solids (TDS) (1586 mg/l), manganese (0.31 mg/l), and iron (2.9 mg/l) (Ref. 1).

2.2 SITE DESCRIPTION

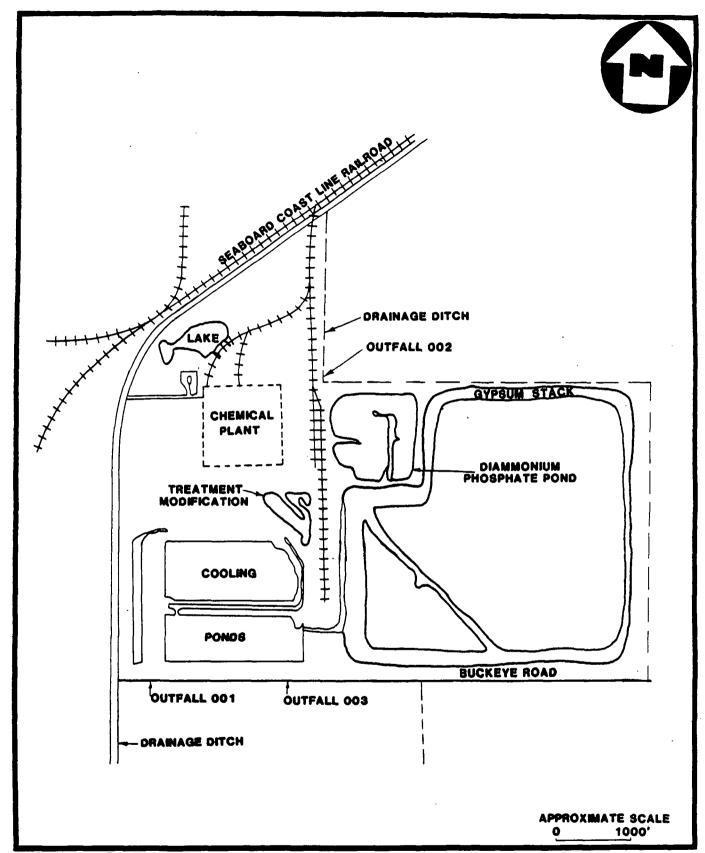
2.2.1 Site Features

AMAX Phosphate is a phosphoric acid complex situated on approximately 670 acres of flat terrain. It is bordered on the west by Highway 41, on the south by Buckeye Road and a citrus grove, on the east by farmland, and on the north by the Manatee Airport, a landing strip. A drainage ditch for nonprocess water on the northern border empties into Piney Point Creek and then into Tampa Bay approximately 2 miles west of the facility, while a drainage ditch along the southern border empties into Bishop Harbor 1 mile to the west, and this also converges with the bay (Appendix A). The plant is fenced on the western, northern, and eastern borders with a guardhouse to the north. Access can be gained by foot on Buckeye Road at the southern border (Ref. 4).

As stated in the preceding section, the complex includes several parts associated with the manufacturing process. An approximately 5-acre manufacturing portion, located to the northwest, consists of sulfuric acid, phosphoric acid, and DAP plants. The largest portion of the property is used for gypsum stacks, the calcium sulfate by-product from the phosphoric acid process, which occupy approximately 253 acres on the southeast. The stacks are surrounded by a drainage ditch that channels water from the stacks back to the plant and also inhibits lateral migration of leachate from the gypsum. There is also a 32-acre DAP pond in the northwest corner of the gypsum stack area, while a 77-acre cooling pond is located in the southwestern corner. Additionally, there is a 1-acre, ammonia removal pond northeast of the cooling pond. Process and nonprocess water, along with gypsum, are pumped to waste disposal areas on the facility, and a network of drainage ditches ultimately leads to the two ditches mentioned above. Railroad tracks, with a spur going into the plant on the northern border of the property, are located along the western border (Ref. 4). A site layout map appears in Figure 2.

2.2.2 Waste Characteristics

The main products which AMAX produces and sells are phosphoric acid and the fertilizer, DAP. In order to make these products, the plant first manufactures sulfuric acid which is used to digest the phosphate ore. The phosphoric acid, produced in this process, is then reacted with ammonia to yield the final product, DAP. AMAX manufactures 2,000 tons of sulfuric acid per day by burning sulfur in air in the presence of a catalyst. Then, the sulfur oxide formed is absorbed in water to produce the



SITE LAYOUT MAP AMAX PHOSPHATE PALMETTO, MANATEE COUNTY, FLORIDA



acid. Brink mist eliminators in towers remove escaping acid mist and sulfur oxide before they are released into the environment. This facility's sulfuric acid plant is the largest single-unit plant in the world. Besides using all of the acid it produces, AMAX purchases an additional 300 tons per day.

Phosphate rock is purchased from a mine in Hillsborough County, Florida. It is crushed and slurried with sulfuric acid. The resulting slurry is filtered to remove the phosphoric acid, formed in the process, from the calcium sulfate or gypsum. The latter is pumped to a gypsum stack/cooling pond complex. The acid formed during this process is concentrated to 54 percent. Impurities in the acid are removed and shipped out of the plant in tanks. The process water from this production has an acidic pH between 1.8 and 2.0. It is used to transport the gypsum to the top of the stack and is recirculated to the plant (Refs. 4, 7). Exhaust from the production is washed with recycled water to remove harmful gases before it is discharge from the stack (Refs. 4, 7).

In order to produce DAP 18-46-0, anhydrous ammonia, phosphoric acid, and 75 percent phosphate rock are mixed together. The resulting slurry is pumped to a solid-materials handling system where the aqueous portion is removed, and the DAP is dried. This plant is one of the largest of its kind in the world. Scrubbers inhibit dust and fumes from being released into the atmosphere. The final product is either used directly as fertilizer or is processed further by other fertilizer plants (Refs. 4, 7).

In the production of DAP and phosphoric acid, gases and particulates are captured by water stream scrubbers. This water is recirculated and reused in production processes. Water is used to slurry the gypsum, and after depositing the gypsum, this water is also recirculated. Once water has come in contact with either the gaseous emissions, dust, or gypsum, it is contaminated and cannot be released by the plant; therefore, excess water is kept in holding ponds. In order to minimize the volume of water, there is an evaporation system consisting of sprayers in the holding areas. During the rainy season when accumulation is increased, water is treated before it is released from the site. Before releasing the water, fluorides and phosphorous products are removed as solids and deposited on the gypsum stacks, and the acidic pH is neutralized with lime (Refs. 4, 7).

The potential for pollution of air and water is inherent in the production and use of fertilizers. The impurities resulting from these manufacturing processes can be inadvertently released into the environment through several pathways and consist of a variety of substances. The plant process water characteristically has a low pH and contains a high concentration of inorganic by-products from the phosphate rock. In addition to high levels of radioactive particle emissions (including mostly uranium-238, radium-226), there are also elevated concentrations of arsenic, cadmium, chromium, lead, sodium, fluoride, manganese, iron, sulfate, and TDS. A study conducted by the Environmental Protection Agency (EPA) indicated that only radium-226, uranium-238, chromium, and arsenic were

present in large enough quantities in phosphogypsum to exceed health-based screening limits (Ref. 8, pp. 12-6, 12-7). Leachate, however, has a higher concentration of contaminants of concern. It was found that the following concentrations of metals in leachate provided a potential health or environmental risk if released into either groundwater or surface water: arsenic, lead, cadmium, chromium, fluoride, zinc, antimony, copper, thallium, nickel, iron, silver, and mercury (Ref. 8, pp. 12-8, 12-9).

Unless the gypsum stacks and cooling ponds are underlain with an impervious liner, contaminants can be discharged to groundwater; however, the soils under the stacks can neutralize or buffer the pH causing some contaminants to precipitate from solution and thus attenuate their migration (Refs. 1; 8; 9, pp. 7, 10; 10, pp. 105-108, 114-119). Also, phosphates, when released into the environment, increase algal growth in surface water which upsets the natural biological balance (Ref. 11, p. 471). Because of the low pH of the process water, some of the fluorides are converted to gaseous hydrogen fluoride and transmitted into the environment during the sprinkling involved with the evaporation process on the gypsum stacks. Fluorides have been periodically found in citrus tree foliage and grass used for cattle grazing in the area (Ref. 4). Additionally, escaping dust and fumes from the plant's stacks can transmit airborne particulate pollutants and by-products.

3.0 REGIONAL POPULATIONS AND ENVIRONMENTS

3.1 POPULATION AND LAND USE

3.1.1 Demography

AMAX Phosphate Facility is located in a sparsely populated area that is mainly used for agriculture and heavy industry (Ref. 4, Appendix A). The total population within a 4-mile radius is 3,817 with the following distribution: 251 between 0 and 1 mile (3.8 residents/residence x number of residences), 679 between 1 and 2 miles, 221 between 2 and 3 miles, and 2,666 between 3 and 4 miles (Ref. 12, Appendix A). There are no schools within 4 miles of the facility (Appendix A).

3.1.2 <u>Land Use</u>

There is a landing strip, Manatee Airport, directly to the north. The immediate area to the south consists of a citrus grove, while there is a cattle ranch and turf farm to the west. The closest neighbors are located in four trailers 50 feet east of the gypsum stacks. The area surrounding the facility is also composed of a large concentration of wetlands (Refs. 4, 13, Appendix A). During the investigation, stressed vegetation was noted along the plant's borders. Also, at times large volumes of smoke were seen emitting from the facility's stacks (Refs. 4, 13). A number of species, having either state or federal protection status, inhabit the area (Ref. 14).

3.2 SURFACE WATER

3.2.1 <u>Climatology</u>

The climate in Manatee County is characterized by long, warm, humid summers and short, mild winters. Average monthly temperatures range from 61°F in January to 82°F in July and August with an average annual temperature of 73°F. Although some rainfall occurs during every month, the season with the highest rainfall extends from June through September (Ref. 15, p. 11). The net annual rainfall is 4 inches (Ref. 16, pp. 43, 63), while the 1-year, 24-hour rainfall is also 4 inches (Ref. 17, p. 93).

3.2.2 Overland Drainage

Surface water run-off from the facility is directed to a ditch system surrounding the waste source areas. These ditches, which accept process and nonprocess water, eventually drain into two canals, one to the north and one running parallel to Buckeye Road on the south. Formerly, two outfalls, 001 and 003 for nonprocess and process water respectively, emptied into the latter canal. This canal also receives drainage from the agricultural land on the west. It flows under Highway 41 and converges with a railroad canal. This canal enters a creek leading to Bishop Harbor 1 mile west of the site, and Bishop Harbor flows into Tampa Bay 1 mile downgradient from this point. Outfall 002, for nonprocess water, is currently in use. It enters a canal on the northern part of the site and flows west under Highway 41 into Piney Point Creek 2,500 feet from AMAX. This creek converges with Tampa Bay 2 miles northwest of the plant (Refs. 4, 13, Appendix A). Additionally, the surrounding area is composed of a large number of wetlands which may accept drainage from the site. Eventually, these wetlands drain into small creeks that also flow toward Tampa Bay to the west and the Little Manatee River 5 miles to the north. This river also empties into Tampa Bay (Appendix A).

3.2.3 <u>Potentially Affected Water Bodies</u>

During the site investigation, people were seen fishing in Bishop's Creek which accepts run-off from the canal south of the plant (Ref. 4, p. 23). Also, Bishop's Harbor is often used for recreational fishing (Ref. 6). The Tampa Bay area supports additional recreational activities such as boating and swimming (Ref. 4, Appendix A). The Manatee County Water Department obtains water from Lake Manatee, which is not on the surface water migration pathway. The remainder of the people obtain potable water from private or community wells; therefore, there are no intakes along the surface water migration pathway (Ref. 4). Part of the plant, along with the area to the west toward Tampa Bay, is on a flood plain. During flooding, the migration of contaminants from the site to the surface water system would be enhanced (Ref. 18). Several state- and federally protected or endangered species inhabit the area (Refs. 8, pp. 12-17, 12-18; 14). In fact, the endangered Florida manatee (Trichechus manatus) is often sighted in the Little Manatee River (Ref. 4). A critical habitat for this species is located 6.5 miles from the plant (Ref. 8, pp. 12-17, 12-18).

3.3 GROUNDWATER

3.3.1 <u>Hydrogeology</u>

The AMAX Phosphate Facility is located in the Gulf Central Lowlands subdivision of the Atlantic (Gulf) Coastal Plain physiographic province and the southeast coastal plain hydrogeologic setting in northwest Manatee County, Florida (Refs. 15, p. 105; 19, plate 28; 20, pp. 277-278). Elevations at the facility range between 8 and 35 feet above mean sea level (amsl) (Appendix A). The major soil types in the area of the facility include the Palmetto, Wabasso, Eau Gallie, and Bradenton fine sands and the Chobee loamy fine sand (Ref. 21, plates 1, 5).

The facility is underlain by Miocene to Recent undifferentiated surficial sands, sandy limestone, and shells whose composition may vary laterally and vertically. These undifferentiated surficial deposits range between approximately 1 to 35 feet thick, and comprise the unconfined surficial aquifer system (Refs. 15, p. 129; 22, p. 62). The average depth to the water table in the area of the facility ranges between 4 and 10 feet below land surface (bls) (Ref. 4). The water table forms a subdued replica of the topographic surface in the area. Seasonal fluctuations of water levels in the surficial aquifer are generally less than 5 feet and are very dependent upon the availability of water (Ref. 15, p. 129). Transmissivity values of the surficial aquifer in Manatee County range from less than 267 to approximately 5,304 ft²/day (Ref. 15, Table 3, p. 35, p. 129). Estimates of storage coefficients of the surficial aquifer range between 0.05 and 0.12, based on laboratory specific-yield tests of sands, sandy limestone, and shells of similar composition to those in the surficial aquifer in Manatee County (Ref. 15, p. 131).

The Miocene Hawthorn Group underlies the surficial aquifer system. The Hawthorn Group ranges between 1 to 35 feet bls and ranges between 356 and 400 feet thick in the facility area (Refs. 15, p. 129; 22, Figure 38, p. 62). The Arcadia Formation and the Tampa Member of the Arcadia Formation comprise the Hawthorn Group in the area of the facility (Ref. 22, Figure 38, p. 62). The Arcadia Formation consists of limestone and dolostone containing varying amounts of quartz sand, clay, and phosphate grains. Sand lenses composed of very fine- to medium-grained quartz sand occur irregularly throughout the formation and are usually less than 5 feet thick. Discontinuous clay lenses also occur sporadically throughout the Arcadia Formation. The clay lenses are generally less than 5 feet thick and are composed of quartz sandy, silty, phosphatic, and dolomitic clays (Ref. 22, p. 58). The Arcadia Formation is approximately 221 feet thick in the area of the facility (Ref. 22, Figure 38, p. 62).

The Tampa Member of the Arcadia Formation is composed primarily of limestone with minor dolomite, sands, and clays. The Tampa Member is approximately 135 feet thick in the area of the facility. The texture and composition of the limestones range from mudstones to packstones. The dolostones range from microcrystalline to very fine-grained in texture and are quartz sandy and clayey in composition with minor to no phosphate. Sand and clay beds occur occasionally within the Tampa Member and are similar in composition and thickness as those found in the overlying Arcadia Formation, except for a significantly lower phosphate content (Ref. 22, p. 70).

The Hawthorn Group acts as an upper confining unit for the underlying Floridan Aquifer System. The rocks that comprise the upper confining unit vary greatly in lithology and are complexly interbedded. Clay beds found in the Hawthorn Group act as very effective confining beds. Vertical hydraulic conductivity values for Hawthorn Group clays, as established from aquifer tests and core samples, range between 5.29×10^{-6} and 2.75×10^{-10} cm/sec (1.5×10^{-2} and 7.8×10^{-7} ft/day) (Ref. 23, p. B-43).

The Oligocene Suwannee Limestone underlies the Hawthorn Group. The Suwannee Limestone is composed of hard, yellow to creamy, fossiliferous limestones. The upper part of the Suwannee Limestone contains thin, discontinuous chert lenses; the basal portion is interbedded with quartz sand and dolomite. The Suwannee Limestone ranges up to approximately 300 feet thick (Refs. 15, p. 28; 23, pp. B-32, B-33).

The Eocene Ocala Limestone underlies the Suwanee Limestone. The Ocala Limestone consists of three units: the Crystal River Member, the Williston Member, and the Inglis Member. All three members are composed of cream to white fossiliferous limestone interbededded with chert beds. The Inglis Member of the Ocala Limestone often contains gray to brown dolomite. The Ocala Limestone ranges between 300 and 600 feet thick (Refs. 15, p. 28; 23, p. B-30).

The Eocene Avon Park Formation underlies the Ocala Limestone. The Avon Park Formation consists of brown fossiliferous limestone. The upper portion of the Avon Park Formation occasionally contains layers of carbonaceous material or peat, and the basal portion may contain small evaporite lenses. The Avon Park Formation may be greater than 1,000 feet thick (Refs. 15, p. 28; 23, pp. B-25, B-27).

The Lower Eocene Oldsmar Formation underlies the Avon Park Formation. The Oldsmar Formation consists of micritic to finely pellital limestone thinly interbedded with fine- to medium-crystalline, vuggy dolomite. The basal portion of the formation is usually more extensively dolomitized than the upper portion and contains pore-filling gypsum deposits and thin beds of anhydrite. The Oldsmar Formation and other lower Eocene carbonate rocks are approximately 1,500 feet thick (Ref. 23, pp. B-22-B-23, plates 3, 33).

The Floridan Aquifer System is a vertically continuous sequence of carbonate rocks of generally high permeability that ranges from late Paleocene to early Miocene age. Less permeable carbonate rocks separate the aquifer system into two aquifers: the Upper and Lower Floridan aquifers (Ref. 23, p. 8-45). The Upper Floridan aquifer is composed of the lower portion of the Tampa Member of the Arcadia Formation (Hawthorn Group), the Suwannee Limestone, the Ocala Limestone, and the Avon Park Formation (Ref. 23, pp. 8-44, 8-47). The top of the Upper Floridan aquifer ranges from 357 to 400 feet bls in the area of the facility (Refs. 22, p. 62; 23, plate 26). The Upper Floridan aquifer is approximately 1,250 feet thick (Ref. 23, plate 28). Transmissivity values range from approximately 4,900 to 160,000 ft²/day (Ref. 15, p. 137). The storage coefficients of the Upper Floridan aquifer in Manatee County range from 2.0 x 10-4 to 2.0 x 10-3. Leakage to the Upper Floridan aquifer is estimated to range from 4.0 x 10-5 to 2.7 x 10-3 ft/day) (Ref. 15, p. 137). The base of the Upper Floridan aquifer is located at approximately -1,650 amsl (Ref. 23, plate 29). The Avon Park Formation is the deepest potable, water-bearing formation in the Upper Floridan aquifer (Ref. 15, p. 28).

3.3.2 Aquifer Use

Within a 4-mile radius of AMAX, the majority of people to the southwest, obtain potable water from the Manatee County Water Department. The remaining people receive water from either private or community wells (Refs. 4, 24, 25). A house count using topographic maps indicates that there are 251 residences using wells within 3 miles of the facility with an additional 260 within 3 to 4 miles (Appendix A). The majority of these wells are completed in the surficial aquifer. Groundwater is also used for irrigation of the farms and groves (Ref. 25).

4.0 FIELD INVESTIGATION

4.1 SAMPLE COLLECTION

During the field investigation, conducted the week of October 15, 1990, FIT 4 attempted to identify and characterize contaminants which may be present in the environment as a result of activities that were conducted at AMAX Phosphate Facility. To accomplish this, FIT 4 collected environmental surface soil, subsurface soil, sediment, surface water, and groundwater samples from a number of strategic locations. These locations were selected based on historical information, hydrogeological data for the region and site area, and direct observation at the site.

4.1.1 Sample Collection Methodology

All sample collection, sample preservation, and chain-of-custody procedures used during this investigation were in accordance with the standard operating procedures as specified in Sections 3 and 4 of the Engineering Support Branch Standard Operating Procedures and Quality Assurance Manual; United States Environmental Protection Agency, Region IV, Environmental Services Division, April 1, 1986.

4.1.2 **Duplicate Samples**

Duplicate samples were offered to and declined by Ivan Nance, a designated representative of Royster Phosphates, Inc. Receipt for sample forms are on file at FIT 4.

4.1.3 Description of Samples and Sample Locations

During the sampling investigation, a total of 44 environmental samples were collected. The samples collected in each media include the following: six surface soil and one gypsum, six subsurface soil, nine surface water, 11 sediment, five groundwater from temporary wells, five groundwater from existing monitoring wells, and one groundwater from a private well. Subsurface soil samples were collected 4 to 10 feet below land surface (bls) at the zone of saturation. Groundwater samples were taken from the same depths.

Four sets of surface soil, subsurface soil, and groundwater samples were taken in conjunction with each other. Two of these sets, one collected to the north of AMAX (AP-SS-01, AP-SB-01, AP-TW-01)

and one to the east (AP-SS-02, AP-SB-02, AP-TW-02) served to establish background conditions. The remaining two sets were collected near waste source areas to determine migration of contaminants. One was taken southwest of the chemical plant (AP-SS-04, AP-SB-04, AP-TW-04) and the other west of the cooling pond (AP-SS-05, AP-SB-05, AP-TW-05). Another surface soil sample was taken near the diammonium phosphate (DAP) pond (AP-SS-03) with the subsurface and groundwater samples (AP-SB-03, AP-TW-03) collected a few feet to the west of the corresponding surface soil sample. A final set of soil samples (AP-SS-06, AP-SB-06) was collected between the cooling pond and drainage ditch. In order to characterize the contaminants in gypsum, a freshly deposited sample (AP-SS-07) was removed from the gypsum stacks.

Nine sets of surface water and sediment samples were collected in conjunction with each other. Two sets, one collected north of the site in the Little Manatee River (AP-SW-01, AP-SD-01) and the other southeast of the facility in Cabbage Slough Creek (AP-SW-02, AP-SD-02) served to establish background conditions. In order to characterize contaminants, two sets were taken from source areas, the cooling (AP-SW-09, AP-SD-09) and ammonia removal (AP-SW-11, AP-SD-11) ponds. Five sets were collected from locations to determine if pollutants were migrating from the facility. Two of these were taken along the drainage pathway of outfalls 001 and 003, which are no longer in use. One set (AP-SW-04, AP-SD-04) was collected downgradient from the outfalls in the drainage ditch and the other (AP-SW-05, AP-SD-05) at the confluence of the ditch and Bishop Creek. The remaining three sets were collected in the drainage pathway of Outfall 002. One of these (AP-SW-06, AP-SD-06) was taken in the drainage ditch downgradient from the outfall, another (AP-SW-07, AP-SD-07) a few feet west, and the third (AP-SW-08, AP-SD-08) in Piney Point Creek. A tenth sediment sample (AP-SD-10) was also collected from the DAP pond to characterize contaminants, and another (AP-SD-12) was taken from the drainage ditch by the gypsum stacks to determine migration of contaminants from the stacks.

Five groundwater samples were collected from existing monitoring wells to determine if contaminants had migrated into the groundwater. Four of these samples (AP-MW-01, AP-MW-03, AP-MW-04, AP-MW-05; 12.5 - 20.15 feet bls) were from wells installed in the surficial aquifer and the fifth from a well installed in the the intermediate aquifer (AP-MW-06; 63.7 feet bls). Also, a private well (AP-PW-01) to the east of AMAX was sampled. Sample codes, descriptions, locations, and rationale are contained in Tables 1, 2, and 3. Sample locations are shown in Figures 3, 4, and 5.

SAMPLE CODES, DESCRIPTIONS, LOCATIONS, AND RATIONALE SOIL SAMPLES AMAX PHOSPHATE FACILITY PALMETTO, MANATEE COUNTY, FLORIDA

Sample Code	Description	Location	Rationale
AP-SS-01	Surface Soil	West side of Manatee Airport Road, 2,000 feet feet north of AMAX	Establish background conditions
AP-SS-02	Surface Soil	East of gypsum stacks 50 feet from AMAX	Establish background conditions
AP-SS-03	Surface Soil	West side of DAP pond, between drainage ditch and pond	Determine migration of contaminants
AP-SS-04	Surface Soil	Southwest corner of chemical plant, west of fence	Determine migration of contaminants
AP-SS-05	Surface Soil	West of cooling pond between drainage ditch and rainwater pond	Determine migration of contaminants
AP-SS-06	Surface Soil	Between drainage ditch and cooling pond	Determine migration of contaminants
AP-SS-07	Gypsum	Gypsum stacks	Characterize contaminants
AP-SB-01	Subsurface Soil	In conjunction with AP-SS-01, collected 4' bls	Establish background conditions
AP-SB-02	Subsurface Soil	In conjunction with AP-SS-02, collected 4' bls	Establish background conditions
AP-SB-03	Subsurface Soil	West of DAP pond and drainage ditch, collected 8' bls	Determine migration of contaminants
AP-SB-04	Subsurface Soil	In conjunction with AP-SS-04, collected 4' bls	Determine migration of contaminants
AP-SB-05	Subsurface Soil	In conjunction with AP-SS-05, collected 10' bls	Determine migration of contaminants
AP-SB-06	Subsurface Soil	In conjunction with AP-SS-06, collected 4' bls	Determine migration of contaminants

AP - AMAX Phosphate Facility

SS - Surface Soil
SB - Subsurface Soil

SAMPLE CODES, DESCRIPTIONS, LOCATIONS, AND RATIONALE GROUNDWATER SAMPLES AMAX PHOSPHATE FACILITY PALMETTO, MANATEE COUNTY, FLORIDA

Sample Code	Description	Location	Rationale
AP-TW-01	Groundwater	In conjunction with AP-SS-01, collected 7' bls	Establish background conditions
AP-TW-02	Groundwater	In conjunction with AP-SS-02, collected 4' bls	Establish background conditions
AP-TW-03	Groundwater	In conjunction with AP-SS-03, collected 10' bls	Determine migration of contaminants
AP-TW-04	Groundwater	In conjunction with AP-SS-04, collected 4' bls	Determine migration of contaminants
AP-TW-05	Groundwater	In conjunction with AP-SS-04, collected 10' bls	Determine migration of contaminants
AP-MW-01*	Groundwater	Southeast corner of plant, surficial aquifer, 15.2' bls	Determine migration of contaminants
AP-MW-03	Groundwater	East of chemical plant, surficial aquifer, 21.2' bls	Determine migration of contaminants
AP-MW-04	Groundwater	North of cooling ponds, surficial aquifer, 22.6' bls	Determine migration of contaminants
AP-MW-05	Groundwater	South of Buckeye Road, surficial aquifer, 15.2' bls	Determine migration of contaminants
AP-MW-06	Groundwater	West of gypsum stack drainage ditch, intermediate aquifer, 65.5' bls	Determine migration of contaminants
AP-PW-01	Groundwater	West of gypsum stacks, 50 feet east of AMAX	Determine migration of contaminants

AP - AMAX Phosphate Facility
TW - Groundwater, Temporary Well
MW - Groundwater, Monitoring Well

* AP-MW-02 was not collected.

SAMPLE CODES, DESCRIPTIONS, LOCATIONS, AND RATIONALE SURFACE WATER AND SEDIMENT SAMPLES AMAX PHOSPHATE FACILITY PALMETTO, MANATEE COUNTY, FLORIDA

Sample Code	Description	Location	Rationale
AP-SW-01	Surface Water	Little Manatee River 5 miles north of AMAX	Establish background conditions
AP-SW-02*	Surface Water	Cabbage Slough Creek 1.5 miles east of AMAX	Establish background conditions
AP-SW-04	Surface Water	Southwest corner of AMAX in drainage ditch downgradient from outfalls 001 and 003	Determine migration of contaminants
AP-SW-05	Surface Water	Confluence of drainage ditch and Bishop Creek	Determine migration of contaminants
AP-SW-06	Surface Water	Drainage ditch downgradient from Outfall 002	Determine migration of contaminants
AP-SW-07	Surface Water	Drainage ditch downgradient from Outfall 002 east of Highway 41	Determine migration of contaminants
AP-SW-08	Surface Water	Piney Point Creek 20 feet north of County Line Road	Determine migration of contaminants
AP-SW-09*	Surface Water	East end of cooling pond	Characterize contaminants
AP-SW-11	Surface Water	West end of ammonia removal pond	Characterize contaminants
AP-SD-01	Sediment	In conjunction with AP-SW-01	Establish background conditions
AP-SD-02*	Sediment	In conjunction with AP-SW-02	Establish background conditions
AP-SD-04	Sediment	In conjunction with AP-SW-04	Determine migration of contaminants
AP-5D-05	Sediment	In conjunction with AP-SW-05	Determine migration of contaminants
AP-SD-06	Sediment	In conjunction with AP-SW-06	Determine migration of contaminants

AP - AMAX Phosphate Facility

SW - Surface Water SD - Sediment

* AP-SW-03, AP-SW-10, and AP-SD-03 were not collected.

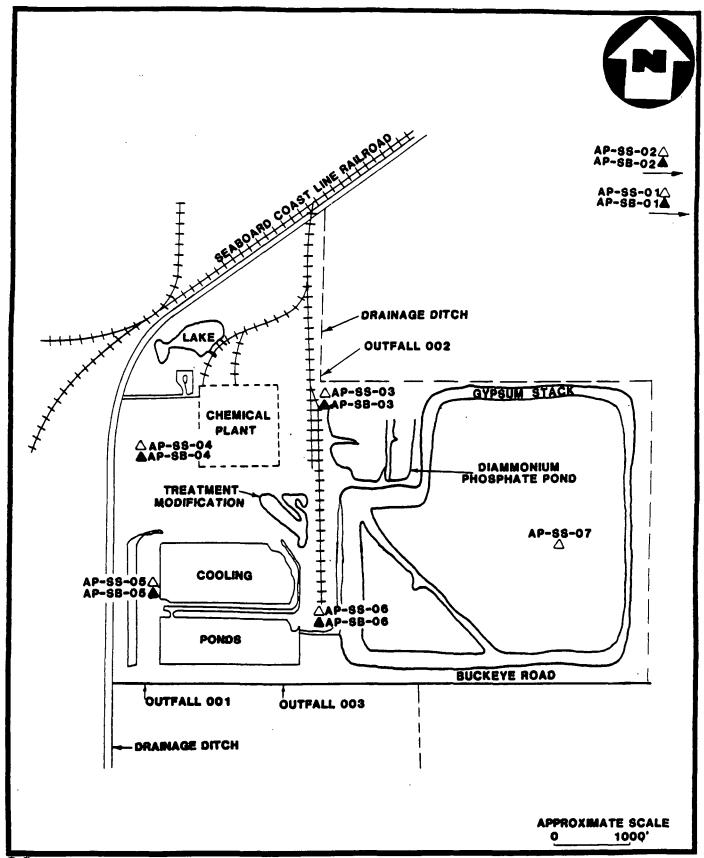
SAMPLE CODES, DESCRIPTIONS, LOCATIONS, AND RATIONALE SURFACE WATER AND SEDIMENT SAMPLES AMAX PHOSPHATE FACILITY PALMETTO, MANATEE COUNTY, FLORIDA

Sample Code	Description	Location	Rationale
AP-SD-07	Sediment	In conjunction with AP-SW-07	Determine migration of contaminants
AP-SD-08	Sediment	In conjunction with AP-SW-08	Determine migration of contaminants
AP-SD-09	Sediment	In conjunction with AP-SW-09	Characterize contaminants
AP-SD-10	Sediment	DAP pond by waste inlet	Characterize contaminants
AP-SD-11	Sediment	In conjunction with AP-SW-11	Characterize contaminants
AP-SD-12	Sediment	Drainage ditch west of gypsum stacks	Determine migration of contaminants

AP - AMAX Phosphate Facility

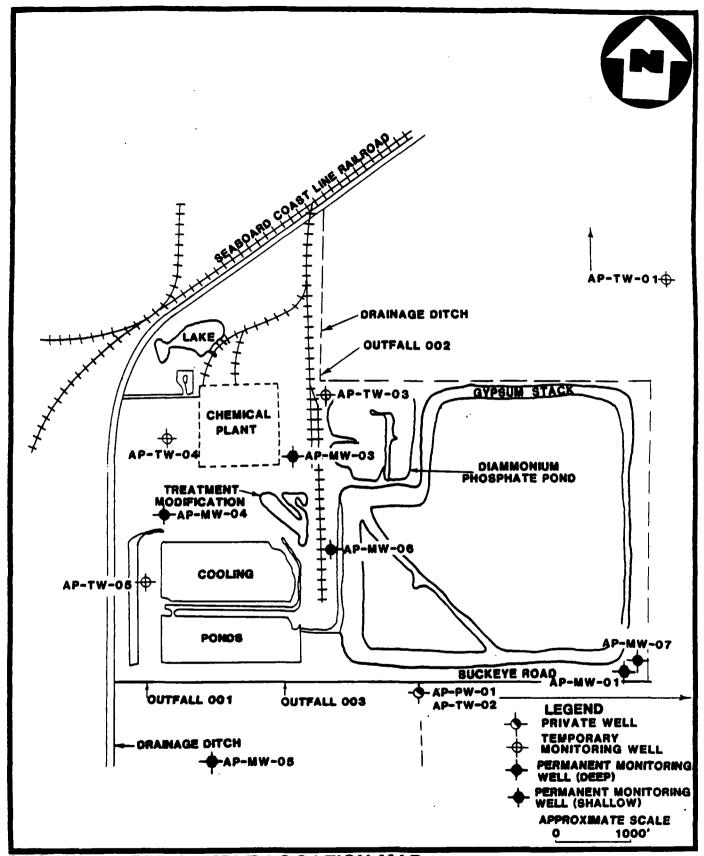
SW - Surface Water SD - Sediment

* AP-SW-03, AP-SW-10, and AP-SD-03 were not collected.



SOIL SAMPLE LOCATION MAP AMAX PHOSPHATE PALMETTO, MANATEE COUNTY, FLORIDA

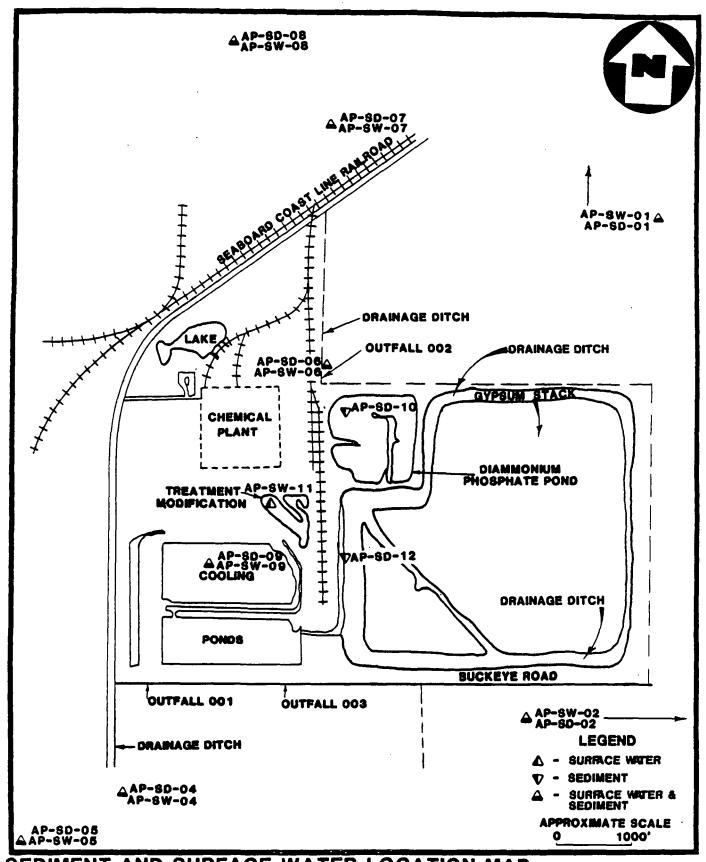
FIGURE 3
NUS
CORPORATION



GROUNDWATER SAMPLE LOCATION MAP AMAX PHOSPHATE PALMETTO, MANATEE COUNTY, FLORIDA

FIGURE 4





SEDIMENT AND SURFACE WATER LOCATION MAP AMAX PHOSPHATE PALMETTO, MANATEE COUNTY, FLORIDA



4.1.4 Field Measurements

Field measurements were performed on all water samples (Table 4). Parameters measured included temperature, pH, and conductivity of the sample at time of collection. No field measurements were performed on the soil samples during this investigation.

4.2 SAMPLE ANALYSIS

4.2.1 <u>Analytical Support and Methodology</u>

All samples collected were analyzed under the Contract Laboratory Program (CLP) and analyzed for all organic parameters listed in the Target Compound List (TCL) and all inorganic parameters in the Target Analyte List (TAL). Organic analysis of soil and water samples was performed by SWOK of Broken Arrow, Oklahoma and Gulf South Environmental Laboratories of New Orleans, Louisiana. Inorganic analysis of soil and water samples was performed by Skinner and Sherman of Waltham, Massachusetts. Additionally, radioactive analysis was performed by National Air and Radiation Environmental Laboratories of Montgomery, Alabama.

All laboratory analyses and laboratory quality assurance procedures used during this investigation were in accordance with standard procedures and protocols as specified in the <u>Laboratory Operations</u> and <u>Quality Control Manual</u>, United States Environmental Protection Agency, Region IV, Environmental Services Division, issued October 24, 1990; or as specified by the existing United States Environmental Protection Agency standard procedures and protocols for the CLP Statement of Work (SOW), as applicable.

4.2.2 <u>Analytical Data Quality and Data Qualifiers</u>

All analytical data were subjected to a quality assurance review as described in the EPA Environmental Services Division laboratory data evaluation guidelines. In the tables, some of the concentrations of the organic and inorganic parameters have been flagged with a "J". This indicates that the qualitative analysis was acceptable, but the quantitative value has been estimated. A few other compounds are flagged with an "N", indicating that they were detected based on the presumptive evidence of their presence. This means that the compound was tentatively identified, and its detection cannot be used as positive identification of its presence. Results for some background samples are reported with a "U" flag. This flag means that the material was analyzed for but not detected. The reported number is the laboratory-derived minimum quantitation limit (MQL) for the compound or element in that sample. At times, miscellaneous organic compounds that do not

TABLE 4

FIELD MEASUREMENTS AMAX PHOSPHATE FACILITY PALMETTO, MANATEE COUNTY, FLORIDA

Sample Code	Date (10/90)	Time	рН	Temp. (°C)	Conductivity (umhos/cm)
AP-SW-01	16	1330	7.0	28.3	6510
AP-SW-02*	16	1415	7.2	30.0	1250
AP-SW-04	17	1620	7.0	29.0	2540
AP-SW-05	17	1645	7.1	28.0	13,200
AP-SW-06	17	1440	8.5	30.0	1930
AP-SW-07	17	1515	6.7	30.0	2390
AP-SW-08	17	1605	6.1	28.0	1920
AP-SW-09*	17	1515	2.5	30.0	17,740
AP-SW-11	17	1445	8.9	31.0	5720
AP-TW-01	16	1625	6.7	27.0	707
AP-TW-02	17	1040	6.5	28.0	180
AP-TW-03	17	1145	6.7	28.0	3320
AP-TW-04	18	1040	6.7	27.0	2870
AP-TW-05	18	0930	6.4	26.0	3390
AP-PW-01	17	0935	7.3	24.0	1070
AP-MW-01*	16	1130	6.7	27.0	980
AP-MW-03	16	0900	6.8	26.0	4050
AP-MW-04	16	1520	7.1	27.0	932
AP-MW-05	16	1350	7.3	28.0	1570
AP-MW-06	16	1615	7.4	27.0	745

^{*} AP-SW-03, AP-SW-10, and AP-MW-02 were not collected.

appear on the target compound list are reported with a data set. These compounds are labeled as "JN", indicating that they are tentatively identified at estimated quantities. Because these compounds are not routinely analyzed for or reported, background levels or MQL values are not generally available for comparison. The complete analytical data sheets are presented in Appendix B.

4.2.3 <u>Presentation of Analytical Results</u>

This section presents a discussion and interpretation of the analytical results from the environmental samples collected during the investigation at AMAX Phosphate Facility. Results of surface soil, subsurface soil, sediment, surface water, and groundwater samples are presented in Tables 5, 6, 7, 8, 9, 10, 11, 12, 13, and 14. Background samples have been designated for all media. Values for background sample results are presented as either a measured value or as the MQL. Samples containing concentrations of contaminants greater than 3 times the background level or MQL of these contaminants are considered to be elevated. These samples are noted in the text.

Results from organic analyses indicated that there was minimal contamination from organic compounds. One soil sample (AP-SS-04) contained a small amount of toluene (3 times background, estimated), while carbon disulfide (3 and 26 times MQL) was present in two monitoring wells (AP-MW-04, AP-MW-06), one surficial, and one intermediate. The carbon disulfide could be a by-product from the sulfuric acid manufacturing process. Additionally, elevated amounts of polycyclic aromatic hydrocarbons were detected in the sediment sample (AP-SD-07) collected adjacent to the railroad tracks. These compounds are probably from the chrysene treated wooden tracks. There were no compounds of concern in elevated quantities in surface water samples.

As indicated in Section 2.2.2, the major contaminants of concern at phosphate facilities are inorganics. Since gypsum is an abundant by-product from the phosphate production, a sample (AP-SS-07) was collected to chemically characterize it. Its composition included the following metals: aluminum, barium, calcium, chromium, iron, lead, magnesium, manganese, nickel, sodium, and vanadium. The only one of these present in elevated quantity with appreciable toxicity was barium (3 times background). Since gypsum is basically calcium sulfate, the level of calcium was the highest (30 times background).

Among the metals of concern detected in onsite surface soil samples were barium, cadmium, chromium, manganese, nickel, selenium, and vanadium. The three most contaminated samples (AP-SS-03, AP-SS-05, AP-SS-06) were collected in the area of either waste storage or chemical processing. The following metals were present in elevated quantities: barium (3, 5, and 3 times

SUMMARY OF ORGANIC ANALYTICAL RESULTS SURFACE AND SUBSURFACE SOIL SAMPLES AMAX PHOSPHATE FACILITY PALMETTO, MANATEE COUNTY, FLORIDA

	Backg	round		On s	Site		Gypsum Background				On Site				
PARAMETERS (ug/kg)	AP-SS-01	AP-\$\$-02	AP-SS-03	AP-SS-04	AP-SS-05	AP-55-06	AP-SS-07	AP-SB-01	AP-SB-02	AP-SB-03	AP-SB-04	AP-SB-05	AP-5B-06		
PURGEABLE COMPOUNDS															
TOLUENE	2)	ار2	-	61	1,1	1,1		6U	6∪				31		
EXTRACTABLE COMPOUNDS															
PHENOL	890U	720U					4801					-			
DI-N-BUTYLPHTHALATE	890U	720U			120)			-	· ·		-		-		
UNIDENTIFIED COMPOUNDS/NO.(1)	80001/5	30001/2	80001/6	30001/2	5000J/4	20003/2	10003/1		8003/1	2000J/2			1000ע		
PETROLEUM PRODUCT ⁽¹⁾		N			N										
DODECANOIC ACID(1)	T						- 2000JN								
HEXADECANOIC ACID ⁽¹⁾						1	4000JN								
PESTICIDE/PCB COMPOUNDS															
4,4'-DDE (P.P'-DDE)	43U	39	-		-	-		-			-	·			
4,4'-DDT (P.P'-DDT)	43U	39						-		-	-				
GAMMA-CHLORDANE	2200	45)			-			-		· ·					
ALPHA-CHLORDANE	220U	52 J	<u> </u>					-		-	-	· _	·		

- Material analyzed for but not detected above minimum quantitation limit (MQL).
- J Estimated value.
- N Presumptive evidence of presence of material.
- U Material was analyzed for but not detected. The number given is the MQL.
- (1) Tentatively identified compound. This compound is not on Target Compound List and is reported only as detected in individual samples; MQL not determined.

The control of the way of the control

TABLE 6

SUMMARY OF INORGANIC ANALYTICAL RESULTS SURFACE AND SUBSURFACE SOIL SAMPLES AMAX PHOSPHATE FACILITY PALMETTO, MANATEE COUNTY, FLORIDA

	Backg	round		On S	iite		Gypsum	Backg	round		On	Site	
PARAMETERS (mg/kg)	AP-SS-01	AP-SS-02	AP-SS-03	AP-SS-04	AP-SS-05	AP-SS-06	AP-SS-07	AP-SB-01	AP-SB-02	AP-SB-03	AP-58-04	AP-SB-05	AP-SB-06
ALUMINUM	1600	200	4600	1300	6000	8300	1100	4500	1100	2900	1100	1700	3100
BARIUM	11	3U	30	13	55	33	30	20	3U	11	5.3	5.6	18
CADMIUM	0.83U	0.63U	2.6	-	4.4	3	-	0.73U	0.69U	-		-	-
CALCIUM	45,000	2100	96,000	9200	190,000	88,000	150,000	1900	130U	42,000	600	6700	63,000
CHROMIUM	4.9	6.8	18	-	29	42	11	7.9	1.4U	6.6	-	4.1	5.2
COBALT	1.1U	0.84U	-	-	2.4	1.5	-		-	-	-	-	-
IRON	1500J	3001	5200J	2600J	4300J	7000J	1800J	4300J	1008	27001	460	ر700	25001
LEAD	7.1J	201	9.5)	-	19)	2 5J	8.91	4.31	1)	1.8J	1.4J	1.3J	3.3J
MAGNESIUM	4500	180	220	260	1100	2700	190	240	30U	280	-	-	390
MANGANESE	24	19	10	-	95	14	25	-	-	-	-	-	-
NICKEL	1.7U	1.3U	5.6	-	9	3.5	3.9	-	-	-			-
POTASSIUM	160U	30U	420	-	860	820	-			-	-	-	-
SELENIUM	0.55UR	0.42UR		4.91	-	-	-	-		-		-	-
SODIUM	280U	30U	1800	•	2600	2900	960	60U	30U	390		-	540
VANADIUM	5U	10	36		56	42	13	6U	10	13	-		

⁻ Material analyzed for but not detected above minimum quantitation limit (MQL).

J Estimated value.

U Material was analyzed for but not detected. The number given is the MQL.

R Quality Control indicates that data is unusable. Compound may or may not be present.

SUMMARY OF ORGANIC ANALYTICAL RESULTS GROUNDWATER SAMPLES AMAX PHOSPHATE FACILITY PALMETTO, MANATEE COUNTY, FLORIDA

	Backg	round	On Site					Private Well	Trip Blank			
PARAMETERS (ug/l)	AP-TW-01	AP-TW-02	AP-TW-03	AP-TW-04	AP-TW-05	AP-MW-01*	AP-MW-03	AP-MW-04	AP-MW-05	AP-MW-06	AP-PW-01	AP-PB-01
PURGEABLE COMPOUNDS												
CARBON DISULFIDE	SU	รบ	-	-		-		14	-	130	•	-
ACETALDEHYDE(1)												61N
EXTRACTABLE COMPOUNDS												
BENZOIC ACID	50U	423	-	-						-	-	
BIS(2-ETHYLHEXYL) PHTHALATE	100	100		·	-	-	-	76	-	-		
DIETHYLMETHYLBENZAMIDE ⁽¹⁾						10JN						
BUTYLIDENEBISMETHYLETHYLMETHYLPHENOL(1)							20JN	201N	NLOI			
OCTANOIC ACID ^{(;})							5JN		6JN			
CAPROLACTAM(1)								100JN		70JN		
UNIDENTIFIED COMPOUNDS/NO.(1)								1ע20	1001/3			
DECANOIC ACID(1)		·		Ī	1				5JN			
BIS(HYDROXYLETHYL)DODECANAMIDE(1)	1	1	1		1				301N			
TETRAMETHYLBUTANE(1)	T		1		71N							

- Material analyzed for but not detected above minimum quantitation limit (MQL).
- J Estimated value.
- N Presumptive evidence of presence of material.
- U Material was analyzed for but not detected. The number given is the MQL.
- (1) Tentatively identified compound. This compound is not on Target Compound List and is reported only as detected in individual samples; MQL not determined.
- * AP-MW-02 was not collected.

TABLE 8

SUMMARY OF INORGANIC ANALYTICAL RESULTS GROUNDWATER SAMPLES AMAX PHOSPHATE FACILITY PALMETTO, MANATEE COUNTY, FLORIDA

<u> </u>	Backg	round		On Site				Private Well	Trip Blank			
PARAMETERS (ug/l)	AP-TW-01	AP-TW-02	AP-TW-03	AP-TW-04	AP-TW-05	AP-MW-01*	AP-MW-03	AP-MW-04	AP-MW-05	AP-MW-06	AP-PW-01	AP-PB-01
ALUMINUM	36,000	260,000	7300	20,000	5600	3400	750		1610	-	-	
ARSENIC	14	53	18	56	-	-	301	-	-	•	-	-
BARIUM	110	460	53	210	130	-	120	-	52	-	-	-
BERYLLIUM	2U	6	-	-	-	-	-	-	<u>.</u>	-	-	
CADMIUM	3U	3 U	-	-	-	-	18	-	-		-	-
CALCIUM	91,000	21,000	600,000	320,000	470,000	81,000	380,000	140,000	270,000	75,000	83,000	-
CHROMIUM	78	190	12	38	13	-	-	-	9	•	-	•
COBALT	7	32	-	9		-	-	-	-	-	-	-
RON	26,000J	ر 170,000	27,000J	25,000J	2300J	33001	10,000J	1300J	3200J	•	•	-
LEAD	18	44	-	12	5	5	-	-	-	8	-	-
MAGNESIUM	20,000	9300	36,000	25,000	39,000	37,000	16,000	16,000	61,000	22,000	40,000	-
MANGANESE	70U	70	•	39		73	220		-	-	•	-
NICKEL	18	89	-	14		-		-	•	-	-	•
POTASSIUM	29,000	2900	23,000	8000	30,000	4000	9100	2600	9300	6400	3700	-
SODIUM	28,000	2200	7000	120,000	55,000	75,000	350,000	36,000	61,000	29,000	55,000	

- Material analyzed for but not detected above minimum quantitation limit (MQL).
- J Estimated value.
- N Presumptive evidence of presence of material.
- U Material was analyzed for but not detected. The number given is the MQL.
- * AP-MW-02 was not collected.

SUMMARY OF INORGANIC ANALYTICAL RESULTS GROUNDWATER SAMPLES AMAX PHOSPHATE FACILITY PALMETTO, MANATEE COUNTY, FLORIDA

	Backg	round		On Site	n Site Onsite Monitoring Wells				Onsite Monitoring Wells						Private Onsite Monitoring Wells Well					
PARAMETERS (ug/l)	AP-TW-01	AP-TW-02	AP-TW-03	AP-TW-04	AP-TW-05	AP-MW-01*	AP-MW-03	AP-MW-04	AP-MW-05	AP-MW-06	AP-PW-01	AP-PB-01								
VANADIUM	74	170	-	-	130		-	-	-		<u>-</u>	•								
ZINC	60 01	130J		-	-		-	-	-		-	-								

- Material analyzed for but not detected above minimum quantitation limit (MQL).
- Estimated value. J
- Ν
- Presumptive evidence of presence of material.

 Material was analyzed for but not detected. The number given is the MQL. U
- AP-MW-02 was not collected.

SUMMARY OF ORGANIC ANALYTICAL RESULTS SEDIMENT SAMPLES AMAX PHOSPHATE FACILITY PALMETTO, MANATEE COUNTY, FLORIDA

	Backg	round	Southern Drainage Pathway		Norther	n Orainage Path	iway	On Site				
PARAMETERS (ug/kg)	AP-SD-01	AP-SD-02*	AP-SD-04	AP-SD-05	AP-SD-06	AP-5D-07	AP-SD-08	AP-SD-09	AP-SD-10	AP-SD-11	AP-SD-12	
PURGEABLE COMPOUNDS											ľ	
ACETONE	13U	310	-	·	26	l —-		37				
CARBON DISULFIDE	6U	10)	· ·		-			-	· -	· ·		
TRIMETHYLBICYCLOHEPTANE ⁽¹⁾						301N						
METHYL(METHYLETHYL)BENZENE ⁽¹⁾						200JN	1	<u> </u>				
UNIDENTIFIED COMPOUNDS/NO.(1)						201/1					1	
EXTRACTABLE COMPOUNDS				<u> </u>								
BENZOK ACID	4100U	10,000U	·			-	-		6901		·	
ACENAPHTHENE	840U	2100U	-		-	1401		·	· -			
PHENANTHRENE	580)	2100U	-	-		760J	·			-		
ANTHRACENE	140J	2100U	-	750)		190J		-				
DI-N-BUTYLPHTHALATE	840U	2100U								150)		
FLUORANTHENE	1400	2100U		· ·	•	3200	·	-		-		
PYRENE	750J	2100U	•			1600		-			· ·	
BENZYL BUTYL PHTHALATE	840U	. 2100U		-			210)			-		
BENZO(A)ANTHRACENE	3301	2100U		1203	-	4901				-		
CHRYSENE	500J	2100U		420J		710)	-		-			

- Material analyzed for but not detected above minimum quantitation limit (MQL).
- J Estimated value.
- N Presumptive evidence of presence of material.
- U Material was analyzed for but not detected. The number given is the MQL.
- (1) Tentatively identified compound. This compound is not on Target Compound List and is reported only as detected in individual samples; MQL not determined.
- * AP-SD-03 was not collected.

TABLE 9

SUMMARY OF ORGANIC ANALYTICAL RESULTS SEDIMENT SAMPLES AMAX PHOSPHATE FACILITY PALMETTO, MANATEE COUNTY, FLORIDA

	Background		Southern (Path	Orainage Iway	Norther	n Drainage Path	nway		On	Site	
PARAMETERS (ug/kg)	AP-SD-01	AP-SD-02*	AP-5D-04	AP-SD-05	AP-SD-06	AP-SD-07	AP-SD-08	AP-SD-09	AP-SD-10	AP-SD-11	AP-SD-12
BIS(2-ETHYLHEXYL) PHTHALATE	840U	2100U		-	-					· ·	•
BENZO(B AND/OR K)FLUORANTHENE	440)	2100U	-	270)		470)	-				
BENZO(A)PYRENE	380)	2100U		210)		3501	-	-	-		
INDENO (1,2,3-CD) PYRENE	220)	2100U	-		-	140J	·			· ·	
BENZO(GHI)PERYLENE	2101	2100U									
UNIDENTIFIED COMPOUNDS/NO.	20001/2	50,0001/15	20001/1	30001/3		20.000#5	20,0001/7	50001/2	30,0003/4	50,000//17	30001/2
PETROLEUM PRODUCT ⁽¹⁾		N		<u> </u>		N	 			N	
DODECANOIC ACID ⁽¹⁾								1000JN	20,000JN		
HEXADECANOIC ACID ⁽¹⁾	600JN	1000JN								1	N(0001
ANTHRACENEDIONE(1)	3001N										
BENZOFLUORENE ⁽¹⁾	3001N					3001N		1			
BENZOFLUORANTHENE(NOT B OR K) ⁽¹⁾	200JN										
BENZACEPHENANTHRYLENE(1)	500JN		1								
TETRAHYDRODIMETHYL(METHYETHYL)NAPHTHALENE(1)			1			2000JN	\$00JN				
NAPHTHALENOL ⁽¹⁾						1000JN					
HEPTADECANOIC ACID(1)		1				N(002		400JN			
OCTADECANOIC ACID(1)	\vdash	1		<u> </u>	 	 		800JN	4000JN	 	†

- Material analyzed for but not detected above minimum quantitation limit (MQL).
- Estimated value.
- N
- Presumptive evidence of presence of material.

 Material was analyzed for but not detected. The number given is the MQL.
- (1) Tentatively identified compound. This compound is not on Target Compound List and is reported only as detected in individual samples; MQL not determined.
- AP-SD-03 was not collected.

SUMMARY OF ORGANIC ANALYTICAL RESULTS SEDIMENT SAMPLES AMAX PHOSPHATE FACILITY PALMETTO, MANATEE COUNTY, FLORIDA

	8ackground		Southern Drainage Pathway No		Norther	Northern Drainage Pathway		On Site			
PARAMETERS (ug/kg)	AP-50-01	AP-SD-02*	AP-SD-04	AP-SD-05	AP-SD-06	AP-SD-07	AP-SD-08	AP-SD-09	AP-SD-10	AP-SD-11	AP-SD-12
PHENYLETHANONE ⁽¹⁾									30001M		
TETRADECANOIC ACID ⁽¹⁾					1	Ī ————			700JN		
PHENYLTRICYCLONODIENOL ⁽¹⁾									2000JN		
DIPHENYLPROPANEDIONE(1)						i			N(0009		1
PESTICIDE/PCB COMPOUNDS		1									
PCB-1248 (AROCLOR 1248)	200U	500U					350				-

- Material analyzed for but not detected above minimum quantitation limit (MQL).
- Estimated value.
- N Presumptive evidence of presence of material.
- Material was analyzed for but not detected. The number given is the MQL.
- (1) Tentatively identified compound. This compound is not on Target Compound List and is reported only as detected in individual samples; MQL not determined.
- AP-SD-03 was not collected.

TABLE 10

SUMMARY OF INORGANIC ANALYTICAL RESULTS SEDIMENT SAMPLES AMAX PHOSPHATE FACILITY PALMETTO, MANATEE COUNTY, FLORIDA

	Background		Southern Drainage Pathway		Northern Drainage Pathway			On Site			
PARAMETERS (mg/kg)	AP-SD-01	AP-SD-02*	AP-SD-04	AP-SD-05	AP-SD-06	AP-SD-07	AP-SD-08	AP-SD-09	AP-SD-10	AP-SD-11	AP-SD-12
ALUMINUM	380	10,000	530	1300	1100	1000	950	21,000	4400	300	12,000
BARIUM	2U	80	19	7.5	5.2	13	13	110	72	16	64
CADMIUM	0.71U	1.9U		-	-	-		2.6	-	-	8
CALCIUM	1400	38,000	2000	3100	8400	27,000	7200	200,000	210,000	220,000	110,000
CHROMIUM	1.4U	20	-	2.8	2.4	6.1	6.6	140	24	7.1	76
COBALT	0.95∪	3∪			-	-	-	2.7	-	3.9	3.4
COPPER	9UJ	62J	-	-	-	-	-	-	-	•	
IRON	440)	11,000J	830)	1600)	90001	6400)	2100J	45,000J	12,000J	390J	18,000J
LEAD	2.8J	16J	1.1)	74)	1.7J	11)	15J	85J	26J	2 1J	591
MAGNESIUM	200	2500	82	1100	170	200	520	2000	510	4500	9900
MANGANESE	2U	63			26	22	-	26	-	44	40
NICKEL	1.4U	6.7	-		2.3	2.7	-	-	4.2	17	7.6
POTASSIUM	60U	27 0 U	-	·			-	2000	550	<u>-</u>	1600
SODIUM	350 U	290 U	-	2900			-	12000	3900	2800	6700
VANADIUM	10	20U			-			140	24	-	130

- Material analyzed for but not detected above minimum quantitation limit (MQL).
- J Estimated value.
- N Presumptive evidence of presence of material.
- U Material was analyzed for but not detected. The number given is the MQL.
- * AP-SD-03 was not collected.

SUMMARY OF ORGANIC ANALYTICAL RESULTS SURFACE WATER SAMPLES AMAX PHOSPHATE FACILITY PALMETTO, MANATEE COUNTY, FLORIDA

	Backg	Background		Northern Orainage Pathway		Southern Drainage Pathway			ite
PARAMETERS (ug/l)	AP-SW-01	AP-SW-02*	AP-SW-04	AP-SW-05	AP-SW-06	AP-SW-07	AP-SW-08	AP-SW-09*	AP-SW-11
PURGEABLE COMPOUNDS					<u> </u>				
CARBON DISULFIDE	5U	5U	-	-	5	-	-		4.1
TETRAMETHYLBUTANE ⁽¹⁾				1					NI8
EXTRACTABLE COMPOUNDS									
UNIDENTIFIED COMPOUNDS/NO.(1)					100)/3			60J/4	
BROMACIL ⁽¹⁾			4JN				4JN		
HEXADECANOIC ACID ⁽¹⁾								10JN	10JN
HYDROXYMETHOXY BENZALDEHYDE(1)								5JN	
PETROLEUM PRODUCT ⁽¹⁾								N	
TETRADECANOIC ACID ⁽¹⁾			1	1	1				7JN

- Material analyzed for but not detected above minimum quantitation limit (MQL).
- J Estimated value.
- N Presumptive evidence of presence of material.
- U Material was analyzed for but not detected. The number given is the MQL.
- (1) Tentatively identified compound. This compound is not on Target Compound List and is reported only as detected in individual samples; MQL not determined.
- * AP-SW-03 and AP-SW-10 were not collected.

TABLE 12

SUMMARY OF INORGANIC ANALYTICAL RESULTS SURFACE WATER SAMPLES AMAX PHOSPHATE FACILITY PALMETTO, MANATEE COUNTY, FLORIDA

	Backg	Background		Northern Drainage Pathway		rn Drainage Pat	On Site		
PARAMETERS (ug/l)	AP-SW-01	AP-SW-02*	AP-SW-04	AP-SW-05	AP-SW-06	AP-SW-07	AP-SW-08	AP-SW-09*	AP-SW-11
ALUMINUM	340U	16,000		-	-			27,000	-
ARSENIC	50	8 U		-		-	-	-	49
BARIUM	20U	120	-	29	-		-	63	-
BERYLLIUM	10	10	-	-	•	-	-	23	-
CADMIUM	3U	3 U		-	-	-	-	130	•
CALCIUM	61,000	170,000	160,000	160,000	150,000	180,000	160,000	670,000	170,000
CHROMIUM	6 U	28	•			-	•	360	-
COBALT	4U	4U		-	-	-		210	-
RON	350UJ	14,000)		-	-		-	29,0001	-
LEAD	5	14		-	-	-	-	35	-
MAGNESIUM	140,000	46,000	58,000	220,000	66,000	59,000	42,000	200,000	49,000
MANGANESE	20υ	110			-	-	52	4100	-
NICKEL	6U	8U		-	-	-	-	690	-
POTASSIUM	47,000	13,000	16,000	68,000	3700	5300	6800	160,000	89,000
SODIUM	1,100,000	68,000	110,000	1,500,000	42,000	100,000	69,000	1,200,000	650,000
THALLIUM	10UR	10UR			-	-	·	13)	-
VANADIUM	4U	30U			-		-	820	

- Material analyzed for but not detected above minimum quantitation limit (MQL).
- J Estimated value.
- N Presumptive evidence of presence of material.
- U Material was analyzed for but not detected. The number given is the MQL.
- R Quality Control indicates that data is unusable. Compound may or may not be present.
- * AP-SW-03 and AP-SW-10 were not collected.

SUMMARY OF INORGANIC ANALYTICAL RESULTS SURFACE WATER SAMPLES AMAX PHOSPHATE FACILITY PALMETTO, MANATEE COUNTY, FLORIDA

	Background		Northern Drainage Pathway		Southern Drainage Pathway			On Site	
PARAMETERS (ug/l)	AP-SW-01	AP-SW-02*	AP-SW-04	AP-SW-05	AP-SW-06	AP-SW-07	AP-SW-08	AP-SW-09*	AP-SW-11
ZINC	40UJ	130UJ	-	-	-	-	-	1400)	-
CYANIDE	10U	10U	•	•	-	14	100	-	•

- Material analyzed for but not detected above minimum quantitation limit (MQL).
- J Estimated value.
- N Presumptive evidence of presence of material.
- U Material was analyzed for but not detected. The number given is the MQL.
- Quality Control indicates that data is unusable. Compound may or may not be present.
- * AP-SW-03 and AP-SW-10 were not collected.

TABLE 13

SUMMARY OF RADIONUCLIDE CONCENTRATIONS IN SOIL SAMPLES

AMAX PHOSPHATE FACILITY

PALMETTO, MANATEE COUNTY, FLORIDA

Parameters (pCi/g) ⁽¹⁾	Background	On Site	Gypsum	Background	Northern	Southern
	AP-SS-01	AP-SS-06	AP-SS-07	AP-SD-01	AP-SD-06	AP-SD-12
Radium-226	0.89 ±	8.12 ±	16.5 ±	0.36 ±	0.76 ±	7.36 ±
	5.00%	1.00%	1.0%	7.00%	5.00%	1.00%
Radium-228	0.56 ±	0.49 ±	8.10 ±	0.85 ±	0.38 ±	0.73 ±
	153%	186%	17.0%	115%	256%	128%

⁽¹⁾ Results are for dry soil.

TABLE 14

SUMMARY OF RADIONUCLIDE CONCENTRATIONS IN WATER SAMPLES

AMAX PHOSPHATE FACILITY

PALMETTO, MANATEE COUNTY, FLORIDA

Parameters (pCi/l)	Background	Monito	ring Wells	Background	Southern Drainage	
	AP-TW-01	AP-MW-03	AP-MW-06	AP-SW-01	AP-SD-12	
Radium-226	7.32 ± 2.00%	16.4 ± 1.00%	1.13 ± 3.00%	0.54 ± 4.00%	1.85 ± 2.00%	
Radium-228	2.43 ± 87.5%	1.76 ± 64.6%	0.53 ± 81.0%	0.53 ± 85.8%	0.29 ± 182%	
Gross Alpha	53.8 ± 21.6%	44.6 ± 42.4%	1.75 ± 169%	5.04 ± 235%	5.30 ± 83.3%	

background); cadmium (3, 5, and 3 times MQL); chromium (3, 5, and 6 times background); and vanadium (7, 10, and 8 times MQL) were detected in all three samples. Nickel (3 and 5 times MQL) was found in two soil samples (AP-SS-03 and AP-SS-05), while manganese (4 times background) was detected in one (4 times background). The only contaminant of concern present in elevated quantities in the fourth onsite sample (AP-SS-04) was selenium (10 times MQL, estimated). There were no inorganics of concern found in elevated quantities in subsurface soil samples.

The only metals of concern detected in elevated quantities in groundwater were cadmium (6 times MQL) and manganese (3 times MQL) from AP-MW-03. This monitoring well is located in the center of the facility between the chemical plant and gypsum stacks. The EPA maximum contaminant level (MCL) for primary drinking water standards for manganese (50 ug/l) was exceeded in this sample (Ref. 26). Although arsenic was detected in levels less than 3 times background, its concentration (56 ug/l) in the sample from AP-TW-04, collected east of the chemical plant, exceeded the MCL (50 ug/l). With samples ranging in concentration from 1,300 to 27,000 ug/l, the secondary MCL (300 ug/l) for iron was also exceeded in seven of the onsite groundwater samples.

The only sediment samples with large quantities of inorganics of concern were collected from the cooling pond (AP-SD-09) and drainage ditch adjacent to the gypsum stacks (AP-SD-12). Both had chromium (7 and 3 times MQL), lead (5 and 4 times background estimated), and vanadium (7 and 6 times MQL). As with the sediment samples, onsite surface water samples were the only ones with elevated quantities of contamination. The surface water sample from the cooling pond contained cadmium (6 times MQL), chromium (13 times MQL), lead (3 times background), manganese (37 times background), nickel (86 times background), and vanadium (27 times MQL). Cyanide (10 times MQL) was also found in one offsite sample collected on the northern drainage pathway, but it is not site related. Since there were no inorganics of concern detected in elevated amounts in either offsite sediment or surface water samples, it can be assumed that these contaminants are not migrating from the facility along the surface water migration pathway.

Radium-226, radium-228, and gross alpha analyses were performed on select soil, sediment, groundwater, and surface water samples. The radium-226 and radium-228 analyses for the sample (AP-SS-07) were 18.5 and 14.5 times background respectively; while the onsite soil sample was 9.1 times background for radium-226, but not elevated for radium-228. The sediment sample collected from the northern drainage ditch (AP-SD-06) was slightly elevated (2 times background) for radium-226 and beneath background values for radium-228. Radium-226 was more elevated (10 times background) in the sediment collected in the southern drainage ditch (AP-SD-12). Although there are no specific criteria for radium deposition, the National Council on Radiation Protection and Measurements (NCRP) has recommended a guide of 40 picocuries of radium-226 per gram of soil as a

concentration to be evaluated for agricultural land use (Ref. 27). All of these values are beneath that quantity.

The gross alpha particle activity for two groundwater samples (AP-TW-01, AP-MW-03) was above the maximum contaminant level (MCL) for primary drinking water standards (15 pCi/l). The sample collected from a surficial aquifer monitoring well (AP-MW-03) was 44.6 pCi/l. This value was slightly lower than the background (53.8 pCi/l) which was above the MCL. The amount of radium-226 in this monitoring well sample (AP-MW-03) was also slightly elevated (2.2 times background). Both groundwater samples (AP-TW-01, AP-MW-03) exceeded the combined radium-226, radium-228 MCL (5 pCi/l) for primary drinking water standards with combined values of 9.75 and 18.2 pCi/l, respectively. Radionuclide analyses were not elevated in the third groundwater sample. The only elevated quantity in surface water was for radium-226 (3.4 times background) in the sample collected from the southern drainage pathway (AP-SW-06).

5.0 SUMMARY

All three contaminant pathways, surface water, groundwater, contact, and air, are of concern for AMAX Phosphate. Surface water run-off from the facility is channeled by way of two drainage ditches into either Bishop Harbor then Tampa Bay, or Piney Point Creek and then Tampa Bay. Fishing, boating, and bathing occur along the surface water migration pathway. Additionally, the area is surrounded by wetlands which drain toward the north into the Little Manatee River. This river is a critical habitat for the Florida manatee (<u>Trichechus manatus</u>), which is often sighted in the river. There are also other federally and state-protected or endangered species with ranges in the area. Furthermore, the facility is located in a flood plain, making migration of contaminants more likely during wet weather.

Since many people within the 4-mile radius obtain potable water from shallow wells, groundwater contamination may pose a serious potential threat. Water for irrigation is also obtained from wells in Manatee County. Additionally, the area is characterized by karst terrain containing sinkholes and underground cavities.

Gases from the site make airborne contamination a potential threat. Emission of phosphorous and sulfur oxides from the stacks pose a potential problem with air contamination. Because of the acidity of the process waters, the small amount of fluorides in the gypsum are converted to hydrogen fluoride. In fact, fluorides that probably originate from hydrogen fluoride are often found during the analysis of grass and foliage. Airborne contamination was evident from the stressed vegetation surrounding the plant. This could affect the residents and cattle in the area also.

Since the gypsum stacks are in the open, and process water is evident throughout the facility, contamination from contact could pose a potential threat to onsite employees. As the facility is not fenced along the southern border, access can be attained by foot.

During this sampling investigation, 44 environmental samples were collected. These include soil, groundwater, sediment, and surface water samples. The only organic pollutants of concern detected in elevated quantities in soil were toluene and carbon disulfide. Carbon disulfide, a by-product in the sulfuric acid manufacturing process, was also found in one groundwater sample collected from an onsite monitoring well. There were no organic compounds of concern that are associated with the processes at the plant found in either sediment or surface water samples.

In order to characterize the inorganic constituents in gypsum, a sample of newly deposited material was analyzed. It contained the following metals: aluminum, barium, calcium, chromium, iron, lead, magnesium, manganese, nickel, sodium, and vanadium. Those inorganics of concern detected in elevated quantities in soil samples, and also found in the gypsum, were barium, cadmium, chromium, manganese, nickel, selenium, and vanadium. Only cadmium and manganese were detected in elevated quantities in one onsite groundwater sample. The primary EPA maximum contaminant level (MCL) for drinking water standards was exceeded for manganese in this sample. Although the quantity of arsenic was not elevated, the MCL was exceeded in one groundwater sample collected on site. Additionally the secondary MCL in drinking water for iron (300 ug/l) was exceeded in seven of the onsite groundwater samples.

Chromium, lead, and vanadium were detected in elevated quantities in a sediment sample collected on site from the drainage ditch, while the only surface water sample containing elevated amounts of inorganics, including cadmium, chromium, lead, manganese, nickel, and vanadium, was taken from the cooling pond. There was no evidence of migration of these contaminants along the surface water pathway from this study.

Analysis for radioactive nuclides in soil samples revealed that the onsite soil sample contained an elevated amount of radium-226 but not radium-228. Also, the amount of this nuclide in the southern drainage pathway was more elevated than in the northern drainage pathway (10 times versus 2 times background). Values of radium-226 and radium-228 were 18.5 and 14.5 times background, respectively, for the gypsum sample. However, none of these values exceeded the National Council on Radiation Protection and Measurements maximum criteria for radium-226 deposition on agricultural land (40 pCi/g). For groundwater samples, the MCL for primary drinking water standards was exceeded for gross alpha particle activity (915 pCi/l) for the background and one onsite surficial aquifer monitoring well sample. Additionally, the combined radium-226, radium-228 MCL (5 pCi/l) was also exceeded for these two samples. This value for radium-226 was exceeded for the surface water sample collected in the southern drainage pathway too; however, this is not a potable source. Unlike the organic and inorganic results, the elevated radium-226 values for the surface water and sediment samples collected in the southern drainage pathway indicate migration of this nuclide from AMAX along the surface water pathway.

Because of the targets associated with the four contaminant pathways and the elevated quantities of contaminants found at AMAX Phosphate, FIT 4 recommends that this site be evaluated using the HRS (effective March 14, 1991).

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- 13. NUS Corporation Field Logbook No. F4-2583 for AMAX Phosphate, TDD No. F4-9009-01. Documentation of sampling investigation, October 16-18, 1990.
- 14. U.S. Fish and Wildlife Service, <u>Gulf Coast Inventory Map of St. Petersburg</u>, <u>Florida</u> (1982).
- 15. G. Michael Kelley, <u>Groundwater Resource Availability Inventory: Manatee County, Florida</u> (Brooksville, Florida: Southwest Florida Water Management District, March 1988), pp. 28, 35, 105, 129, 131, 147.
- 16. U.S. Department of Commerce, <u>Climatic Atlas of the United States</u> (Washington, D.C.: GPO, June 1968) Reprint: 1983, National Oceanic and Atmospheric Administration.
- 17. U.S. Department of Commerce, <u>Rainfall Frequency Atlas of the United States</u>, Technical Paper Number 40 (Washington, D.C.: GPO, 1961).
- 18. FIRM Flood Insurance Rate Map for Manatee County, Florida, Community-Panel Number 120153 (Panels 18 and 19 of 550, Federal Emergency Management Agency, revised March 15, 1984).
- 19. O.E. Meinzer, <u>The Occurrence of Ground Water in the United States</u>, U.S. Geological Survey Water-Supply Paper No. 489 (Washington, D.C.: GPO, 1923), plate 28.
- 20. Linda Aller, et al., <u>DRASTIC: A Standardized System for Evaluating Ground Water Pollution</u>
 Potential Using Hydrogeologic Settings, EPA-600/2-87-035 (Ada, Oklahoma: EPA, April 1987).
- 21. U.S. Department of Agriculture, Soil Conservation Service, <u>Soil Survey of Manatee County</u>, <u>Florida</u> (April 1983), pp. 63-64, 68-69, 70-71, 80, 85-86, plates 1, 5.

- 22. Thomas M. Scott, <u>The Lithostratigraphy of the Hawthorn Group (Miocene) of Florida</u>, Bulletin No. 59 (Tallahassee, Florida: Florida Geological Survey, 1988), pp. 58, 62, 70.
- 23. James A. Miller, <u>Hydrogeologic Framework of the Floridan Aquifer System in Florida and in Parts of Georgia, Alabama, and South Carolina</u>, U.S. Geological Survey Professional Paper No. 1403-B (Washington, D.C.: GPO, 1986), pp. B-22-B-23, B-25-B-27, B-30, B-32-B-33, B-43, plates 3, 26, 28, 29, 33.
- 24. Arnold Becken, Hillsborough County Water Distribution, telephone conversation with Maureen Gordon, NUS Corporation, October 8, 1990. Subject: Northern boundary for water distribution, Hillsborough County.
- 25. James P. Marshall, Well Construction Permit Coordinator, Southwest Florida Water Management, letter and well listings for 4-mile radius area, to Maureen Gordon, NUS Corporation, September 27, 1990. Subject: Listing of wells in northwestern Manatee and southwestern Hillsborough counties, Florida.
- 26. <u>Ground Water Guidance Concentrations</u>, compiled by Randy Merchant for the Florida Department of Environmental Regulation, Division of Water Facilities, February 1989.
- 27. <u>Development of Regional Impact Application for Development Approval for IMC Fertilizer, Inc., New Wales Gypsum Stack Expansion</u>, Polk County, Florida (July 1988).

U.S. EPA REGION IV

SDMS

Unscannable Material Target Sheet

•	11.	Sire		
ite Name:	<u>Hew</u>	SITE		
		Same and the same and the same	4	
lature of Ma	terial:			
Map:		•	Computer Disks:	
Photos:		•	CD-ROM:	
Blueprints:		-	Oversized Report:	
Slides:			Log Book:	
Other (desc	ribe):	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	
	material(1) Appe	Idiv A		

APPENDIX B

1

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METALS DATA	REPORT								
** PROJEC ** SOURCE ** STATIO	T NO. 91-025 : AMAX PHOSPI N ID: 55-01 !UMBER: 15099	ATE FACIL	* * * * * 0. 51680 S NUMBER:	SAMPLE TYPE		PROG CITY: COLLE		COLLECTED BY: M GORDON ST: FL 10/16/90 1520 STOP: 00/0	**
MG/KG 1600 8.60 1600 A 20J A 20J A 0.28U B 0.83U C 45000 C 4.9 C 1.1U C 8UJ 1500J T.1J		* * * * * * * * * * * * * * * * * * *		• • • • •	• • • •	* * * * * * * * * * * * * * * * * * *	MANGANESE MERCURY NICKEL POTASSIUM SELENIUM SILVER SODIUM THALLIUM TIN VANADIUM ZINC PERCENT MOI	ANALYTICAL RESULTS	• • • • • • • • • • •

^{***}FOOTNOTES***

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN

*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

*R-QC INDICATES THAT DATA UNUSABLE, COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

SOURCE AMAX PHOSPHATE FACIL COLLECTION START: 10/17/90 0925 CASE NUMBER: 15099 SAS NUMBER: MD NUMBER: Y144 . ** .. MG/KG ANALYTICAL RESULTS MG/KG **ANALYTICAL RESULTS** 200 5.10 **ALUMINUM** 19 MANGANESE ANTIMONY ARSENIC Ó. 10U MERCURY NICKEL 103 1 . 3ປ POTASSIUM SELENIUM SILVER 3Ŭ BARIUM 30U 0.21U 0.63U 2100 0.42UR 1.1UJ BERYLLIUM CADMIUM CALCIUM SODIUM 300 CHROMIUM 0.42U THALLIUM 6.8 COBALT COPPER IRON TIN VANADIUM 0.84U NA 200J 300J 50J 10 ZINC 20UJ LEAD PERCENT MOISTURE

CITHERALMERS

COLLECTED BY: M GURDON

FOOTNOTES

180

MAGNESIUM

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NCT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

METALS DATA REPORT	Zivi Nedroit IV Ebb, Willetts, Git.	12,0-1,00
*** * * * * * * * * * * * * * * * * * *	TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON ST: FL COLLECTION START: 10/17/90 1020 STOP: MD NUMBER: Y148	00/00/00
MG/KG ANALYTICAL RESULTS 4600 ALUMINUM 5.7U ANTIMONY 2UJ ARSENIC 30 BARIUM 1U BERYLLIUM 2.6 CADMIUM 96000 CALCIUM 18 CHROMIUM 2U COBALT 4UJ COPPER 5200J IRON 9.5J LEAD 220 MAGNESIUM	MG/KG ANALYTICAL RESULTS 10 MANGANESE 0.12U MERCURY 5.6 NICKEL 420 POTASSIUM 2.4UR SELENIUM 1.2UJ SILVER 1800 SODIUM 0.48U THALLIUM NA TIN 36 VANADIUM 20UJ ZINC 19 PERCENT MOISTURE	• • • • • • • • • • • • • • • • • • • •

^{***}FOOTNOTES***

^{*}FOUNDIES***

*A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN

*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

METALS DATA REPORT	Ever NEEDS TO ESS, WILLIES, W.	12,01,00
	E TYPE: SOIL PROG ELEM: NSF COLLECTED 8Y: M GORDO CITY: PALMETTO ST: FL COLLECTION START: 10/18/90 1020 STO MD NUMBER: Y173	P: 00/00/00
MG/KG ANALYTICAL RESULTS 1300 ALUMINUM 7.7U ANTIMONY 2UJ ARSENIC 13 BARIUM 0.26U BERYLLIUM 0.77U CADMIUM 9200 CALCIUM 3U CHROMIUM 1.8U COBALT 5UJ COPPER 2600J IRON 8.9U LEAD 260 MAGNESIUM	MG/KG ANALYTICAL RESULTS 4U MANGANESE O.12U MERCURY 1.5U NICKEL 40U POTASSIUM 4.9J SELENIUM 1.3UJ SILVER 190U SODIUM O.50U THALLIUM NA TIN 4U VANADIUM 4UJ ZINC 23 PERCENT MOISTURE	• • • • • • • • • • • • • • • • • • • •

^{***}FOOTNOTES***

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*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
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METALS DATA REPORT	EPA-REGION IV ESD, ATHENS, GA.	12/04/90
*** PROJECT NO. 91-025 SAMPLE NO. 51666 SAMPLE SOURCE: AMAX PHOSPHATE FACIL STATION ID: SS-05 CASE NUMBER: 15099 SAS NUMBER:	CITY: PÄLMETTO ST: FL	00/00/00
MG/KG MG/KG ALUMINUM 6.5U ANTIMONY 2.3UR ARSENIC 55 BARIUM 1U BERYLLIUM 4.4 CADMIUM 190000 CALCIUM 29 CHROMIUM 29 CHROMIUM 2.4 COBALT 5UJ COPPER 4300J IRON 19J LEAD 1100 MAGNESIUM	MG/KG ANALYTICAL RESULTS 95 MANGANESE 0.11U MERCURY 9 NICKEL 860 POTASSIUM 3.4UR SELENIUM 1.1UJ SILVER 2600 SODIUM 1U THALLIUM NA TIN 56 VANADIUM 50UJ ZINC 14 PERCENT MOISTURE	• • • • • • • • • • • • • • • • • • • •

^{***}FOOTNOTES***

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
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*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

METALS DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51668 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON .. SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO ST: FL * * COLLECTION START: 10/17/90 1205 STOP: 00/00/00 STATION ID: SS-06 . . ** SAS NUMBER: MD NUMBER: Y152 ** ** CASE NUMBER: 15099 ** ** **ANALYTICAL RESULTS** MG/KG ANALYTICAL RESULTS MG/KG MANGANESE 8300 **ALUMINUM** 14 5.70 ANTIMONY 0.100 MERCURY 1.2UR ARSENIC 3.5 NICKEL POTASSIUM 33 BARIUM 820 2.4UR ĪŪ BERYLLIUM SELENIUM 1.2UJ SILVER CADMIUM **88000** 2900 CALCIUM SODIUM 42 1.5 CHROMIUM 0.48U THALLIUM TIN COBALT COPPER **VANADIUM** 7UJ IRON 20UJ ZINC 7000J PERCENT MOISTURE 25J 2700 LEAD MAGNESIUM

^{***}FOOTNOTES***

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

^{*}K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

^{*}R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

METALS DA	TA DEDODT			LFA	-VEGTOR IA	LSD, ATTL	NS, UA.		12/04/90
### # # #	IA REPORT								
	ECT NO. 91-02	CAMDIS	NO. 51667	SAMPLE TYP	DE COTI	DPOC	ELEM: NSF COLL	ECTED BY: M GORDON	**
	CE: AMAX PHOS			JAMPLE ITE	E. 301L		PALMETTO	ST: FL	••
** SUUR	ION ID: SS-07	LUMIE LACIE				COLLE	CTION START: 10/	17/90 1150 STOP:	
** STAT	NUMBER: 1509:	0	SAS NUMBER			MON	UMBER: Y153	17/90 1150 STUP:	,,
	NUMBER: 1509	9	SAS NUMBER	•		MU N	UMBEK: Y153		**
**									
*** * * *	* * * * * * *	* * * * * *				* * * * *	* * * * * * * * *	7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	
MG/KG		ANALYTICA	AL RESULTS			_MG/KG		LYTICAL RESULTS	
1100	ALUMINUM					25	MANGANESE		
5.40 30J 30 10	ANTIMONY					0.100	MERCURY		
301	ARSENIC					3.9	NICKEL		
30	BARIUM					240U	POTASSIUM		
10	BERYLLIUM					2.3UR	SELENIUM		
10	CADMIUM					1.1UJ	SILVER		
150000	CALCIUM					960_	SODIUM		
11	CHROMIUM					0.450	THALLIUM		
2υ	COBALT					NA	TIN		
2์ปั 2UJ	COPPER					13	VANADIUM		
1800J	IRON					20UJ	ZINC		
8.9J	LEAD					16	PERCENT MOISTUR	E	
190	MAGNESIUM								

^{***}FOOTNOTES***

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

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METALS DATA REPORT	EFR REGION IV CSD, ATTIENS, GA.	12/04/90
*** * * * * * * * * * * * * * * * * * *	TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GC CITY: PALMETTO ST: FL COLLECTION START: 10/16/90 1535 MD NUMBER: Y139	ORDON ** STOP: 00/00/00
MG/KG ALUMINUM 5.9U ANTIMONY 2UJ ARSENIC 2O BARIUM 1U BERYLLIUM 0.73U CADMIUM 1900 CALCIUM 7.9 CHROMIUM 0.98U COBALT 0.73UJ COPPER 4300J IRON 4.3J LEAD 240 MAGNESIUM	MG/KG ANALYTICAL RESULT 3U MANGANESE O.11U MERCURY 2U NICKEL 160U POTASSIUM O.47UR SELENIUM 1.2UJ SILVER 60U SODIUM O.47U THALLIUM NA TIN 6U VANADIUM 4UJ ZINC 21 PERCENT MOISTURE	* * * * * * * * * * * * * * * * * * *

^{***}FOOTNOTES*** *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

```
METALS DATA REPORT
PROJECT NO. 91-025
                     SAMPLE NO. 51686 SAMPLE TYPE: SOIL
                                                      PROG ELEM: NSF COLLECTED BY: M GORDON
..
                                                      CITY: PALMETTO
**
    SOURCE: AMAX PHOSPHATE FACIL
                                                                           ST: FL
                                                                                                   **
                                                      COLLECTION START: 10/17/90 0945 STOP: 00/00/00
    STATION ID: SB-02
CASE NUMBER: 15099
..
                                                                                                   **
                         SAS NUMBER:
..
                                                       MD NUMBER: Y145
                                                                                                   **
**
                                                                                                   .
. ...
                                                                    ANALYTICAL RESULTS
   MG/KG
                  ANALYTICAL RESULTS
                                                    MG/KG
       ALUMINUM
1100
                                                          MANGANESE
                                                   10
                                                          MERCURY
        ANT I MONY
                                                   0.110
5.5V
        ARSENIC
                                                          NICKEL
1UJ
                                                   1.40
       BARIUM
                                                   30U
30
                                                          POTASSIUM
0.23U
0.69U
                                                   0.47UR
                                                          SELENIUM
       BERYLLIUM
       CADMIUM
CALCIUM
                                                   1.2UJ
                                                          SILVER
1300
                                                   30U
                                                          SODIUM
       CHROMIUM
                                                   Ŏ. 47U
                                                           THALLIUM
1.40
0.920
       COBALT
                                                          TIN
       COPPER
                                                   10
                                                          VANADIUM
0.69UJ
800J
       IRON
                                                   4UJ
                                                          ZINC
                                                          PERCENT MOISTURE
                                                   19
1J
       LEAD
300
       MAGNESIUM
```

^{***}FOOTNOTES***

*A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

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*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

^{*}V-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

METALS DATA REPORT		,,
*** * * * * * * * * * * * * * * * * * *		
** PROJECT NO. 91-025 SAMPLE NO. 51671 SAMPLE	TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON	**
** SOURCE: AMAX PHOSPHATE FACIL	CITY: PALMETTO ST: FL	**
** STATION ID: SB-03 ** CASE NUMBER: 15099 SAS NUMBER:	COLLECTION START: 10/17/90 1135 STOP: MD NUMBER: Y149	00/00/00
## CASE NUMBER: 19099 SAS NUMBER:	MU NUMBER. 1145	**
	* * * * * * * * * * * * * * * * * * * *	
MG/KG ANALYTICAL RESULTS	MG/KG ANALYTICAL RESULTS	
2900 ALUMINUM	5U MANGANESE	
5.6U ANTIMONY 1UJ ARSENIC	O.12U MERCURY 1.4U NICKEL	
11 BARIUM	900 POTASSIUM	
0.24U BERYLLIUM	O.5OUR SELENIUM	
O.24U BERYLLIUM O.71U CADMIUM 42000 CALCIUM	1.2UJ SILVER	
42000 CALCIUM	390 SODIUM	
6.6 CHROMIUM 0.94U COBALT 0.71UJ COPPER	O.SOU THALLIUM NA TIN	
0.71UJ COPPER	13 VANADIUM	
2700J IRON	4UJ ZÎNC	
1.8J LEAD	22 PERCENT MOISTURE	
280 MAGNESIUM		

^{***}FOOTNOTES***

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*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

METALS DATA REPORT		tivi integral to too, ville	110, GM.	12,01,00
** PROJECT NO. 91-0: ** SOURCE: AMAX PHO: ** STATION ID: SB-0-0: ** CASE NUMBER: 150:	SPHATE FACIL	CITY: COLLE	ELEM: NSF COLLECTED BY: M GORDON PALMETTO ST: FL CTION START: 10/18/90 1030 STOP UMBER: Y174	: 00/00/00
MG/KG 1100 ALUMINUM 7.4U ANTIMONY 2UJ ARSENIC 5.3 BARIUM 0.25U BERYLLIUM 0.74U CADMIUM 600 CALCIUM 2U CHROMIUM 1.7U COBALT 3UJ COPPER 460 IRON 1.4J LEAD 60U MAGNESIUM	ANALYTICAL RESULTS	MG/KG 3U 0.11U 1.5U 33U 0.73UR 1.2UJ 60U 0.49U NA 2U 4UJ 20	ANALYTICAL RESULTS MANGANESE MERCURY NICKEL POTASSIUM SELENIUM SILVER SODIUM THALLIUM TIN VANADIUM ZINC PERCENT MOISTURE	

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

METALS DATA REPORT		12,01,00
** PROJECT NO. 91-025 SAMPLE NO. 516 ** SOURCE: AMAX PHOSPHATE FACIL ** STATION ID: SB-05 ** CASE NUMBER: 15099 SAS NUMBER:	CITY: PALMETTO ST: FL COLLECTION START: 10/18/90 0910 STOP	P: 00/00/00 ***
MG/KG ALUMINUM 7.2U ANTIMONY 2UJ ARSENIC 5.6 BARIUM 0.24U BERYLLIUM 0.72U CADMIUM 6700 CALCIUM 4.1 CHROMIUM 1.7U COBALT 6UJ COPPER 700J IRON 1.3J LEAD 190U MAGNESIUM		• • • • • • • • • • • • • • • • • • • •

^{***}FOOTNOTES***

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

12/04/90

METALS DATA REPORT			-	· · ·		_, _ ,
** PROJECT NO. 91-0 ** SOURCE: AMAX PHO ** STATION ID: SB-0 ** CASE NUMBER: 150	25 SAMPLE NO. 51670 SPHATE FACIL 6	* * * * * * * * * * * * * * * * * * *	PROG E CITY: COLLEC		CTED BY: M GORDON	00/00/00
MG/KG 3100 ALUMINUM 5.3U ANTIMONY iUJ ARSENIC 18 BARIUM 0.22U BERYLLIUM iU CADMIUM 63000 CALCIUM 5.2 CHROMIUM 5.2 CHROMIUM 0.88U COBALT 2UJ COPPER 2500J IRON 3.3J LEAD 390 MAGNESIUM	ANALYTICAL RESULTS		2U 180U 0.47UR 1.1UJ 540 0.47U NA 6U 5UJ		YTICAL RESULTS	• • • • • • • • • • • • • • • • • • • •

^{***}FOOTNOTES***

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

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METALS DATA REPORT	EPA-REGION IV ESD, ATHE	.NS, GA.	12/04/90
*** * * * * * * * * * * * * * * * * * *	CITY:	ELEM: NSF COLLECTED BY: M GORDON PALMETTO ST: FL CTION START: 10/16/90 1335 STOP HUMBER: Y136,	: 00/00/00 ***
MG/KG ALUMINUM 5.7U ANTIMONY 2UJ ARSENIC 2U BARIUM 0.24U BERYLLIUM 0.71U CADMIUM 1.400 CALCIUM 1.4U CHROMIUM 0.95U COBALT SU 9UJ COPPER 440J IRON 2.8J LEAD 200 MAGNESIUM	MG/KG 2U 0.11U 1.4U 60U 0.48UR 1.2UJ 350U 0.48U NA 1U 9UJ 22	MANGANESE MERCURY NICKEL POTASSIUM SELENIUM SILVER SODIUM THALLIUM TIN VANADIUM ZINC PERCENT MOISTURE	•••••

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

METALS DATA REPORT	• • • • • • • • • • • • • • • • • • • •	1=/ + 1/ + 1
_ *** * * * * * * * * * * * <u>*</u> * * * * *	SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/16/90 1420 STOP: MD NUMBER: Y140	00/00/00
	MG/KG ANALYTICAL RESULTS 63 MANGANESE 0.26U MERCURY 6.7 NICKEL 270U POTASSIUM 1.2UR SELENIUM 3.2UJ SILVER 290U SODIUM 1.2U THALLIUM NA TIN 20U VANADIUM 70UJ ZINC 69 PERCENT MOISTURE	

^{***}FOOTNOTES***

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN

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*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

** SOURCE: AMAX PHOSPHATE FACIL ** STATION ID: SD-04 ** CASE NUMBER: 15099 SAS NUMBER: ** CASE NUMBER: 15099 SAS NUMBER: ** CASE NUMBER: Y166	,,,
** PROJECT NO. 91-025 SAMPLE NO. 51645 SAMPLE TYPE: SOIL ** SOURCE: AMAX PHOSPHATE FACIL ** STATION ID: SD-04 ** CASE NUMBER: 15099 SAS NUMBER: ** MG/KG ANALYTICAL RESULTS ** MG/KG ANALYTICAL RESULTS ** MG/KG ANALYTICAL RESULTS	
** SOURCE: AMAX PHOSPHATE FACIL ** STATION ID: SD-04 ** CASE NUMBER: 15099 SAS NUMBER: ** MG/KG ANALYTICAL RESULTS ** MG/KG ANALYTICAL RESULTS ** MG/KG ANALYTICAL RESULTS ** CITY: PALMETTO COLLECTION START: 10/17/90 1630 STOP: 00/00/00 ** MD NUMBER: Y166 . ** MG/KG ANALYTICAL RESULTS	-
++ STATION ID: SD-04 ++ CASE NUMBER: 15099 SAS NUMBER:	
++ STATION ID: SD-04 ++ CASE NUMBER: 15099 SAS NUMBER:	* *
** CASE NUMBER: 15099 SAS NUMBER: MD NUMBER: Y166 ** ********************************	*
** *** * * * * * * * * * * * * * * * *	* *
MG/KG ANALYTICAL RESULTS MG/KG ANALYTICAL RESULTS	
MG/KG ANALYTICAL RESULTS MG/KG ANALYTICAL RESULTS	
	•
GRO ALIMINIM	
5.6U ÂNTIMONY O.10U MERCURY	
1ÚÚ AŘŠĚNÍC 1.4U NICKEL	
19 BAŘÍUM 30U POTASSIUM	
O.23U BERYLLIUM O.49UR SELENIUM O.70U CADMIUM 1.2UJ SILVER	
2000 CALCIUM 60Ü SODIUM	
1.4U CHROMIUM 0.49U THALLIUM	
O.93U COBALT NA TIN	
3UJ COPPER 1U VANADIUM	
830J IRON 9UJ ZINC	
1.1J LEAD 20 PERCENT MOISTURE	
82 MĀGNESIUM	

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*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM

EPA-REGION IV ESD, ATHENS, GA. 12/04/90 METALS DATA REPORT

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PROJECT NO. 91-025 SAMPLE NO. 51643 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON .. SOURCE: AMAX PHOSPHATE FACIL ST: FL ** CITY: PALMETTO STATION ID: SD-05 COLLECTION START: 10/15/90 1655 STOP: 00/00/00 MD NUMBER: Y168

**

MG/KG **ANALYTICAL RESULTS** MG/KG **ANALYTICAL RESULTS** ALUMINUM 20Ü

1300 MANGANESE ANTIMONY ARSENIC 6.90 Ö. 14U MERCURY 20J 7.5 1.70 NICKEL BARIUM 280U POTASSIUM 0.290 BERYLLIUM 0.57UR SELENIUM 1.4UJ 0.860 CADMIUM SILVER CALCIUM 2900 3100 SODIUM 2.8 CHROMIUM 0.570 THALLIUM 1.10 COBALT TIN COPPER VANADIUM 20UJ 20UJ 31 IRON 1600J ZINC LEAD PERCENT MOISTURE 74J

SAS NUMBER:

FOOTNOTES

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1100

CASE NUMBER: 15099

MAGNESIUM

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

^{*}R-OC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

12/04/90

METALS DATA REPORT		,,
** PROJECT NO. 91-025 SAMPLE NO. 51655 SAMPLE	TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON	**
** SOURCE: AMAX PHOSPHATE FACIL	CITY: PALMETTO ST: FL	**
** STATION ID: SD-06 ** CASE NUMBER: 15099 SAS NUMBER:	COLLECTION START: 10/17/90 1445 STOP MD NUMBER: Y156	: 00/00/00
** CASE NUMBER: 15099 SAS NUMBER.	MD NUMBER. 1130	
MG/KG ANALYTICAL RESULTS	MG/KG ANALYTICAL RESULTS	
1100 ALUMINUM	26 MANGANESE	
6U ANTIMONY 1UJ ARSENIC 5.2 BARIUM	O.11U MERCURY	
1UJ ARSENIC 5.2 BARIUM	2.3 NICKEL 400 POTASSIUM	
0.25U BERYLLIUM	O.48UR SELENIUM	
0.25U BERYLLIUM 0.75U CADMIUM	1.2UJ SILVER	
8400 CALCIUM	14QŬ SODIUM	
2.4 CHROMIUM	0.48U THALLIUM	
1U COBALT	NA TIN	
4UJ COPPER	3U VANADIUM	
9000J IRON 1.7J LEAD	9UJ ZINC 21 PERCENT MOISTURE	
170 MAGNESIUM	21 PERCENT MUISTURE	
170 MAGNESION		

^{***}FOOTNOTES***

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METALS DATA REPORT	ETA REGION IV ESD, ATTENS, GA.	12,04,50
** PROJECT NO. 91-025 SAMPLE NO. 51653 SAMPLE ** SOURCE: AMAX PHOSPHATE FACIL ** STATION ID: SD-07 ** CASE NUMBER: 15099 SAS NUMBER:	CITY: PALMETTO ST: FL	00/00/00
MG/KG ALUMINUM 6.2U ANTIMONY 2UJ ARSENIC 13 BARIUM 0.26U BERYLLIUM 0.78U CADMIUM 27000 CALCIUM 6.1 CHROMIUM 1U COBALT 8UJ COPPER 6400J IRON 11J LEAD 200 MAGNESIUM	MG/KG ANALYTICAL RESULTS 22 MANGANESE 0.12U MERCURY 2.7 NICKEL 50U POTASSIUM 0.52UR SELENIUM 1.3UJ SILVER 140U SODIUM 0.52U THALLIUM NA TIN 5U VANADIUM 30UJ ZINC 26 PERCENT MOISTURE	• • • • • • • • • • • •

^{***}FOOTNOTES***

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METALS DA	ATA REPORT		
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** PRO.	JECT NO. 91-025 SAMPLE NO. 51648 SAMPLE TYPE: SC	OTI PROG	ELEM: NSF COLLECTED BY: M GORDON **
	RCE: AMAX PHOSPHATE FACIL		PALMETTO ST: FL **
	TION ID: SD-08	COLLE	CTION START: 10/17/90 1610 STOP: 00/00/00 ***
	E NUMBER: 15099 SAS NUMBER:	MOLEL	1UMBER: Y164 ++
	E NUMBER: 15099 SAS NUMBER.	MU N	
**			**
*** * * *			
MG/KG		MG/KG	ANALYTICAL RESULTS
950 70 20J	ALUMINUM	200	MANGANESE
70	ANTIMONY	0.140	MERCURY
2UJ	ARSENIC	20	NICKEL
13	BARIUM	2ับ 50ับ	POTASSIUM
0.298	BERYLLIUM	0.59UR	SELENIUM
0.29U 0.87U 7200	CADMIUM	1.4UJ	SILVER
7200	CALCIUM	1600	SODIUM
6 6	CHROMIUM	Ö. 59υ	THALLIUM
6.6 1.2U	COBALT	NA NA	TIN
1.20	COPPER		
20UJ		4U 400 L	VANADIUM
2100J	IRON	40UJ	ZINC
15J 520	LEAD	33	PERCENT MOISTURE
520	MAGNESIUM		

^{***}FOOTNOTES*** *FOUNDIES***
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*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
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METALS DATA REPORT	ETA NEGICIA TO ESS., ATTICIOS, GA.	12/04/00
*** * * * * * * * * * * * * * * * * * *	TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1530 STOP: MD NUMBER: Y162	00/00/00
MG/KG ALUMINUM 20U ANTIMONY 2.1UR ARSENIC 110 BARIUM 2U BERYLLIUM 2.6 CADMIUM 200000 CALCIUM 140 CHROMIUM 2.7 COBALT 10UJ COPPER 45000J IRON 85J LEAD 2000 MAGNESIUM	MG/KG ANALYTICAL RESULTS 26 MANGANESE 0.17U MERCURY 4U NICKEL 2000 POTASSIUM 0.86UR SELENIUM 2.1UJ SILVER 12000 SODIUM 4UJ THALLIUM NA TIN 140 VANADIUM 70UJ ZINC 54 PERCENT MOISTURE	• • • • • • • • • • • • • • • • • • • •

^{***}FOOTNOTES***

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METALC DATA DEDODT	EPA-REGION IV ESD, ATHENS, GA.	12/04/90
METALS DATA REPORT *** * * * * * * * * * * * * * * * * *	TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDO CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1045 STO MD NUMBER: Y150.	OP: 00/00/00
MG/KG ANALYTICAL RESULTS 4400 ALUMINUM 8.6U ANTIMONY 0.37UR ARSENIC 72 BARIUM 0.36U BERYLLIUM 2U CADMIUM 210000 CALCIUM 24 CHROMIUM 2U COBALT 3UJ COPPER 12000J IRON 26J LEAD 510 MAGNESIUM	MG/KG ANALYTICAL RESULTS 9U MANGANESE 0.19U MERCURY 4.2 NICKEL 550 POTASSIUM 3.7UR SELENIUM 1.8UJ SILVER 3900 SODIUM 0.74U THALLIUM NA TIN 24 VANADIUM 20UJ ZINC 46 PERCENT MOISTURE	•••••

^{***}FOOTNOTES***

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12/04/90 **METALS DATA REPORT**

PROJECT NO. 91-025 SAMPLE NO. 51649 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON ** ** SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO ST: FL ** .. COLLECTION START: 10/17/90 1505 STOP: 00/00/00 ** STATION ID: SD-11 .. CASE NUMBER: 15099 SAS NUMBER: MD NUMBER: Y159 ** ** ** **

MG/KG **ANALYTICAL RESULTS** MG/KG **ANALYTICAL RESULTS ALUMINUM** 300 44 MANGANESE MERCURY **ANTIMONY** 0.18U 9.20 ARSENIC **4UJ** 17 NICKEL BARIUM 2900 16 POTASSIUM 0.380 BERYLLIUM SELENIUM 0.82UR 20 CADMIUM 1.9UJ SILVER 220000 CALCIUM 2800 SODIUM 7.1

CHROMIUM 0.82U THALLIUM 3.9 COBALT TIN 2UJ COPPER 5U VANADIUM IRON ZINC

20UJ 51 390J PERCENT MOISTURE 2.1J LEAD 4500 MAGNESIUM

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METALS DATA REPORT
   PROG ELEM: NSF COLLECTED BY: M GORDON
   PROJECT NO. 91-025 SAMPLE NO. 51669 SAMPLE TYPE: SOIL
                                                                                                  **
   SOURCE: AMAX PHOSPHATE FACIL
                                                                          ŚŤ: "FĽ
                                                     CITY: PALMETTO
..
                                                                                                  ..
   STATION ID: SD-12
CASE NUMBER: 15099
                                                     COLLECTION START: 10/17/90 1230 STOP: 00/00/00
                                                                                                  . .
..
                         SAS NUMBER:
                                                      MD NUMBER: Y154
**
                                                                                                  ..
                                                                                                  ..
**
MG/KG
                  ANALYTICAL RESULTS
                                                   MG/KG
                                                                   ANALYTICAL RESULTS
12000
       ALUMINUM
                                                  40
                                                          MANGANESE
       ANTIMONY
6.9U
                                                  0.140
                                                          MERCURY
1.5UR
       ARSENIC
                                                  7.6
                                                          NICKEL
                                                          POTASSIUM
64
2U
       BARTUM
                                                  1600
       BERYLLIUM
                                                  3.1UR
                                                          SELENIUM
       CADMIUM
                                                  1.4UJ
                                                          SILVER
110000
       CALCIUM
                                                  6700
                                                          SODIUM
       CHROMIUM
76
                                                  0.610
                                                          THALLIUM
                                                      NA
       COBALT
                                                          TIN
8UJ
       COPPER
                                                  130
                                                          VANADIUM
18000J
       IRON
                                                  70ÜJ
                                                          ZINC
       LEAD
MAGNESIUM
                                                  36
                                                          PERCENT MOISTURE
59J
9900
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^{***}FOOTNOTES***

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METALS DATA REPORT	the Medical IV ESS, America, da.	12/04/30
*** * * * * * * * * * * * * * * * * * *	LE TYPE: GROUNDWA PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/16/90 1625 STOP: MD NUMBER: Y142	00/00/00
	UG/L 70U MANGANESE 0.20U MERCURY 18 NICKEL 29000 POTASSIUM 10UJ SELENIUM 5UJ SILVER 28000 SODIUM 10UR THALLIUM NA TIN 74 VANADIUM 60UJ ZINC	• • • • • • • • • • • • • • • • • • •

^{***}FOOTNOTES***

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*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN

*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

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METALS DATA REPORT	The Region 17 Ess, Afficial, GA.	12/04/00
*** * * * * * * * * * * * * * * * * * *	TYPE: GROUNDWA PROG ELEM: NSF COLLECTED BY: M GO CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1040 MD NUMBER: Y146	RDON ** STOP: 00/00/00 **
UG/L ANALYTICAL RESULTS 260000 ALUMINUM 24U ANTIMONY 53 ARSENIC 460 BARIUM 6 BERYLLIUM 3U CADMIUM 21000 CALCIUM 190 CHROMIUM 32 COBALT 20U COPPER 170000J IRON 44 LEAD 9300 MAGNESIUM	UG/L 70 MANGANESE 0.20U MERCURY 89 NICKEL 2900 POTASSIUM 10UJ SELENIUM 5UJ SILVER 2200 SODIUM 2UR THALLIUM TIN 170 VANADIUM 130J ZINC	S

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12/04/90

METALS DATA REPORT	THE REGION IN LOS, AMERICA, GA.	12,04,50
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** SOURCE: AMAX PHOSPHATE FACIL	CITY: PALMETTO ST: FL	**
** STATION ID: TW-03	COLLECTION START: 10/17/90 1145 STOP:	00/00/00 **
** CASE NUMBER: 15099 SAS NUMBER:	MD NUMBER: Y151	**
**		**
UG/L ANALYTICAL RESULTS	UG/L ANALYTICAL RESULTS	
7300 ALUMINUM	30U MANGANESE	
24U ANTIMONY	O. 20U MERCURY	
18 ARSENIC 53 BARIUM	6U NICKEL 23000 POTASSIUM	
18 ARSENIC 53 BARIUM 1U BERYLLIUM 3U CADMIUM	10UJ. SELENIUM	
3U CADMIUM	5UJ SILVER	
600000 CALCIUM	7000 SODIUM	
12 CHROMIUM 4U COBALT	2UR THALLIUM	
4U COBALT 4U COPPER	NA TIN 20U VANADIUM	
27000J IRON	50UJ ZINC	
3U LEAD		
36000 MAGNESIUM		

^{***}FOOTNOTES***

METALS DATA REPORT	LEATREGION IV ESD, ATHENS, GA.	12/04/90
···• · · · · · · · · · · · · · · · · ·	CITY: PALMETTO ST: FL	OON ** TOP: 00/00/00 **
UG/L ANALYTICAL RESULTS 20000 ALUMINUM 24U ANTIMONY 56 ARSENIC 210 BARIUM 2U BERYLLIUM 3U CADMIUM 320000 CALCIUM 38 CHROMIUM 9 COBALT 3U COPPER 25000J IRON 12 LEAD 25000 MAGNESIUM	UG/L 39 MANGANESE 0.20U MERCURY 14 NICKEL 8000 POTASSIUM 10UJ SELENIUM 5UJ SILVER 120000 SODIUM 10UR THALLIUM NA TIN 50U VANADIUM 80UJ ZINC	• • • • • • • • • • • • • • • • • • • •

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METALS DA	TA REDORT			-	I A NEGIGIA IV	LJU, ATTIL	143, GA.		12,04,50
*** * * *	* * * * * *					* * * * *			* * * * * * * * * * * * * * * * * * * *
** PROJ	ECT NO. 91-025	SAMPLE	NO. 51664	SAMPLE T	YPE: GROUNDWA	PROG	ELEM: NSF	COLLECTED BY: M GORDON	**
** SOUR	CE: AMAX PHOSP	HATE FACIL	•			CITY:	PALMETTO	ST: FL	**
** STAT	ION ID: TW-05					COLLE	CTION START:	10/18/90 0930 STOP	: 00/00/00
** CASE	NUMBER: 15099		SAS NUMBER	:		MD N	UMBER: Y172		**
**									**
*** * * *		* * * * *	* * * * *	* * * * *	* * * * * *	* * * * *	* * * * * *	* * * * * * * * * *	
UG/L	A	ANALYTICA	AL RESULTS			UG/L	*****	ANALYTICAL RESULTS	
5600	ALUMINUM					100	MANGANESE		
240	ANTIMONY					0.20U	MERCURY		
24U 3U 130 1U 3U	ARSENIC BARIUM					6U 30000	NICKEL POTASSIUM		
130	BERYLLIUM					1000	SELENIUM		
ส์ม	CADMIUM					50J	SILVER		
470000	CALCIUM					55000	SODIUM		
13	CHROMIUM					10UR	THALLIUM		
ÀŬ	COBALT					NA	TIN		
13 40 60	COPPER					130	VANADIUM		
2300J	IRON					60ŬJ	ZINC		
5	LEAD								
39000	MAGNESTUM								

^{***}FOOTNOTES***

*A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN

*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

```
METALS DATA REPORT
PROG ELEM: NSF COLLECTED BY: M GORDON
   PROJECT NO. 91-025 SAMPLE NO. 51673 SAMPLE TYPE: GROUNDWA
   SOURCE: AMAX PHOSPHATE FACIL
                                                   CITY: PALMETTO
                                                                        ST: FL
**
                                                                                               **
   STATION ID: MW-01
CASE NUMBER: 15099
                                                   COLLECTION START: 10/16/90 1130 STOP: 00/00/00
                                                                                               **
..
                        SAS NUMBER:
                                                    MD NUMBER: Y326
##
                                                                                               **
**
                                                                                               **
UG/L
                 ANALYTICAL RESULTS
                                                  UG/L
                                                                 ANALYTICAL RESULTS
3400
       ALUMINUM
                                                73
                                                        MANGANESE
                                                0.200
300
       ANTIMONY
                                                        MERCURY
6Ú
       ARSENIC
                                                8U
                                                        NICKEL
                                                4000
                                                        POTASSIUM
300
       BARIUM
                                                        SELENIUM
ĬŨ
                                                30
       BERYLLIUM
       CADMIUM
                                                5ÚJ
                                                        SILVER
30
81000
       CALCIUM
                                                75000
                                                        SODIUM
                                                10UR
5U
       CHROMIUM
                                                        THALLIUM
7Ŭ
                                                     NA
       COBALT
                                                        TIN
7Ú
       COPPER
                                                        VANADIUM
                                                50UJ
3300J
       IRON
                                                        ZINC
       LEAD
```

REMARKS HOLDING TIME EXCEEDED-CN ***REMARKS***

FOOTNOTES

37000

MAGNESIUM

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

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*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

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METALS DATA REPORT	ETA REGION IV ESD, ATTIERS, GA.	12/04/30
** PROJECT NO. 91-025 SAMPLE NO. 51687	SAMPLE TYPE: GROUNDWA PROG ELEM: NSF COLLECTED BY: M GORDON	**
** SOURCE: AMAX PHOSPHATE FACIL	CITY: PALMETTO ST: FL	**
** STATION ID: MW-03		00/00/00 **
** CASE NUMBER: 15099 SAS NUMBER:	MD NUMBER: Y328	**
**		**
UG/L ANALYTICAL RESULTS	UG/L ANALYTICAL RESULTS	
750 ALUMINUM	220 MANGANESE	
30U ANTIMONY	O.20U MERCURY	
30J ARSENIC	6U NICKEL	
120 BARIUM	9100 POTASSIUM	
1U BERYLLIUM	15UJ SELENIUM	
18 CADMIUM	5UJ SILVER	
380000 CALCIUM	350000 <u>SODIUM</u>	
SU CHROMIUM 7U COBALT 3U COPPER	1OUR THALLIUM	
7U COBALT	NA TIN	
3U COPPER	8U VANADIUM	
10000J IRON	240UJ ZINC	
4U LEAD		
16000 MAGNESIUM		

REMARKS
HOLDING TIME EXCEEDED-CN

REMARKS

^{*}A-ACTUAL VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

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*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

METAIS DA	TA REPORT					-			· - • - •
*** * * *		* * * * *		* * * * * * *					* * * * ***
	ECT NO. 91-025		NO. 51679	SAMPLE TYPE:		PROG ELE		COLLECTED BY: M GORDON	**
** SOUR ** STAT	RCE: AMAX PHOSP 'ION ID: MW_ 04_	HAIE FAUIL			Y	CITY: PA	LMEIIU ON START	ST: FL : 10/16/90 1520 STOP: 00/00/00	•
** CASE	NUMBER: 15099		SAS NUMBER:	:	,	MD NUMB	ER: Y327	. 10/10/90 1320 310F. 00/00/00	**
**									**
*** * * *	* * * * * * *	ANALYTICAL		* * * * * * *			• • • •	* * * * * * * * * * * * * * * * * * *	* * * * ***
UG/L 440U	ALUMINUM	ANALYTICAL	- KESULIS		80		NGANESE	ANALYTICAL RESULTS	
300	ANT I MONY				0.20U	J ME	RCURY		
300 300	ARSENIC				6U		CKEL		
300	BARIUM BERYLLIUM				2 600 3UJ		TASSIUM LENIUM		
10 30	CADMIUM				50J	ŠĨ	LVER		
140000	CALCIUM				36000) SQ	DIUM		
<u>5</u> U	CHROMIUM				2UR		ALLIUM		
50 70 50	COBALT COPPER				40	NA TI	N NADIUM		
1300J	IRON				50บ ม	ŽÎ			
30	LEAD								
16000	MAGNESIUM								

REMARKS HOLDING TIME EXCEEDED-CN ***REMARKS***

FOOTNOTES

^{*}A-AVERAGE *ALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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12/04/90

METALS DATA REPORT *** * * * * * * * * * * PROJECT NO. 91-025 SAMPLE NO. 51676 SAMPLE TYPE: GROUNDWA PROG ELEM: NSF COLLECTED BY: M GORDON SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO ** ST: FL STATION ID: MW-05 COLLECTION START: 10/16/90 1350 STOP: 00/00/00 CASE NUMBER: 15099 MD NUMBER: Y329 .. SAS NUMBER: ** ** .. UG/L ANALYTICAL RESULTS UG/L ANALYTICAL RESULTS **ALUMINUM** 1610 50Ū MANGANESE 300 ANTIMONY 0.20U MERCURY 6ŬĴ ARSENIC 6U NICKEL 52 10 9300 BARIUM **POTASSIUM** BERYLLIUM 301 SELENIUM ЗÜ CADMIUM 5UJ SILVER 270000 CALCIUM 61000 SODIUM 9 **CHROMIUM** 10UR THALLIUM 70 COBALT TIN COPPER **VÂÑADIUM** ЭŪ 20U 3200J IRON 50ŬJ ZINC ЭÜ LEAD 61000 MAGNESIUM

REMARKS HOLDING TIME EXCEEDED-CN ***REMARKS***

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METALS D	ATA REPORT										,,
*** * *	* * * * * * * * *		* * * *		* * *	* * * *	* * *				
** PRO	JECT NO. 91-025	SAMPLE N	O. 51682	SAMPLE	TYPE:	GROUNDWA		OG ELEM: NS			**
	RCE: AMAX PHOSPHA	ATE FACIL						TY: PALMETT			**
** STA	TION ID: MW-06 E NUMBER: 15099		S NUMBER				CO	LLECTION STA D NUMBER: Y	ART: 10/16/90 161	5 STOP: 00/00/00	0 ** **
** CASI	E NUMBER: 15099	34	S NUMBER				· ·	D NUMBER: T	143		• • • • • • • • • • • • • • • • • • • •
*** * * *							* * *				
UG/L		ANALYTICAL	RESULTS				UG/L		ANALYTICAL RE	SULTS	
1600	ALUMINUM						7U	MANGANE:	SE		
240	ANTIMONY						0.4UJ 6U	MERCURY			
20 90	ARSENIC Barium						6400	NICKEL POTASSI	184		
10	BERYLLIUM						100J	SELENIU			
10 30	CADMIUM						50J	SILVER			
75000	CALCIUM						29000	SODIUM			
6U 4U 3U	CHROMIUM						10UR	THALLIU	И		
4U 2U	COBALT COPPER						30	NA TIN VANADIU	ua.		
170U	IRON						60UJ	ZINC	•		
8	LEAD							22110			
22000	MAGNESIUM										

^{***}FOOTNOTES*** *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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METALS DATA REPORT	ELA REGION IV ESS, ATTENS, GA.	12/04/30
	CITY: PALMETTO ST: COLLECTION START: 10/17/90 093	M GORDON **
		ESULTS

^{***}FOOTNOTES***

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METALS DA	ATA REPORT									• • •	,	~										12,07	, 00
*** * * 1		* * *		* 1			-	* * *				* *	* * *	* * *	* * *	* * :	* * *	* * * *	* *	* * *			***
	JECT NO. 91 RCE: AMAX P		SAMPLE TE FACTI	. NU.	51677	SAM	PLE	TYPE:	SUKI	PAULW			i ELEM: ': Paln		COLLE	CIED	ST:	GORDON					**
** STAT	TION ID: SW	i–02	IL INCIL	•							Č	COLL	ECTION	İSTART	: 10/1	6/90	1415		: 00/	00/00)		**
	E NUMBER: 1	5099		SAS	NUMBER:							MD	NUMBER	t: Y141	•	•			•				**
**																							**
UG/L			NALYTICA			• •	•			• •	ŪG,		• • •	• • •			AL RES		• •	• • •	• • •	• • •	
16000	ALUMINUM										110			ANESE									
240	ANT I MONY ARSENTE										0 . 20l BU	J	MERC										
120	RADIUM										13000)	NICK	SSIUM									
8U 120 1U 3U	BERYLLIUM	}									4UJ		SELE	NIUM									
30	CADMIUM										5UJ		SILV	ER									
170000	CHROMIUM										68000 10UR	,	SODI	LIUM									
28 40	COBALT											NA											
1100	COPPER										30U			DIUM									
14000J 14	IRON LEAD										1300	j	ZINC	•									
46000	MAGNESIUM	i																					

^{***}FOOTNOTES***

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METALS DATA REPORT	EPA-REGION I	V ESU, ATHENS, GA.	12/04/90
*** * * * * * * * * * * * * * * *			
** PROJECT NO. 91-025 SAMPLE	NO. 51646 SAMPLE TYPE: SURFAC	EWA PROG ELEM: NSF COLLECTED BY:	
** SOURCE: AMAX PHOSPHATE FACIL		CITY: PALMETTO ST:	
** STATION ID: SW-04		COLLECTION START: 10/17/90 162	
** CASE NUMBER: 15099 S	AS NUMBER:	MD NUMBER: Y167	**
**			##
UG/L ANALYTICAL	RESULTS	UG/L ANALYTICAL RE	SULTS
40U ALUMINUM		20U MANGANESE	
24U ANTIMONY 3U ARSENIC 20U BARIUM 1U BERYLLIUM 3U CADMIUM		O. 20U MERCURY	
3U ARSENIC		6U NICKEL	
20U BARIUM		16000 POTASSIUM	
1U BERYLLIUM		10UJ SELENIUM	
3U CADMIUM		5UJ SILVER	
160000 CALCIUM		110000 SODIUM	
6U CHROMIUM 4U COBALT 5U COPPER		10UR THALLIUM	
4U COBALT 5U COPPER		NA TIN	
170UJ IRON		4U VANADIUM 50UJ ZINC	
		50UJ ZINC	
3U LEAD 58000 MAGNESIUM			
JUCCO MINISTER STOM			

^{***}FOOTNOTES***

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METALS DA	TA DEDODT		EPA-REGION IV ESD,	ATHENS, GA.	•	12/04/90
*** * * *	* * * * * * * *		• • • • • • • • •			
	ECT NO. 91-025 CE: Amax Phosphat			PROG ELEM: NSF COLLECT CITY: PALMETTO	ED BY: M GORDON ST: FL	**
	ION ID: SW-05	TE TACIE		COLLECTION START: 10/17/		
** CASE	NUMBER: 15099	SAS NUMBER:		MD NUMBER: Y169		**
**						
UG/L		NALYTICAL RESULTS	UG		ICAL RESULTS	
80U	ALUMINUM		50U 0.20U	MANGANESE J MERCURY		
24U 5U	ANTIMONY ARSENIC		6U	NICKEL		
29	BARIUM		68000) POTASSIUM		
50 29 10 30	BERYLLIUM CADMIUM		2UJ 5UJ	SELENIUM SILVER		
160000	CALCIUM		15000			
6U	CHROMIUM		10UR	THALLIUM		
4Ŭ 4Ŭ	COBALT COPPER		30	NA TIN VANADIUM		
240UJ	IRON		40UJ	ZINC		
30	LEAD		,			
220000	MAGNESIUM					

^{***}FOOTNOTES***

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METALS DATA REPORT	
_ +++ + + + + + + + + + + + + + + + + +	· • • • • • • • • • • • • • • • • • • •
** PROJECT NO. 91-025SAMPLE NO. 51656 SAMPLE TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: I	
** SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO ST:	: FL **
** STATION ID: SW-06 COLLECTION START: 10/17/90 1440	IO STOP: 00/00/00 **
** CASE NUMBER: 15099 SAS NUMBER: MD NUMBER: Y157	**
**	**
UG/L ANALYTICAL RESULTS UG/L ANALYTICAL RE	SULTS
150U ALUMINUM 5U MANGANESE	
24U ANTIMONY 0.20U MERCURY	
2U ARSENIC 6U NICKEL 3OU BARIUM 3700 POTASSIUM	
30U BARTUM 3700 POTASSIUM	
ĬŪ BĒRŸLLIUM 2UJ SĒLENĪŪM	
ĠŮ ČĀĎMĨŬŇ 5UJ SILVER	
150000 ČAĽČÍÚM 42000 SODIÚM	
ĠŨ CHROMIUM 10UR THALLIUM	
4U COBALT NA TIN	
5U COPPER 3U VANADIUM	
ŽŽOUJ ĪRON SOUJ ŽĪNC	
2U LEAD	
66000 MAGNESIUM	

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METALC DA	TA DEDORT			EPA-KEGIUN I	V ESD, ATHENS, GA.	•	12/04/90
METALS DA		* * * * * :					
** PROJ	ECT NO. 91-025 CE: AMAX PHOSPH	SAMPLE I	NO. 51654 SAMP	E TYPE: SURFAC	EWA PROGELEM: N CITY: PALME		**
** STAT	ION ID: SW-07				COLLECTION	START: 10/17/90 1515 STOP	o: 00/00/00 **
** CASE	NUMBER: 15099	5/	AS NUMBER:		MD NUMBER:	¥161	**
*** * * * UG/L	* * * * * * *	ANALYTICAL	* * * * * * * * RESULTS	* * * * * * *	* * * * * * * * * * * * * * * * * * *	ANALYTICAL RESULTS	
50U	ALUMINUM	, and in the contract of the c	NESCE 15		40U MANGAN	NESE	
240 20 200	ANTIMONY ARSENIC				0.20U MERCUF 6U NICKEL		
200	BARIUM BERYLLIUM				5300 POTASS 10UJ SELENI		
10 30	CADMIUM				5UJ SILVER	R	
180000 6U	CALCIUM CHROMIUM				100000 SODIUN 10UR THALLI		
4Ŭ 3U	COBALT COPPER				NA TIN BU VANADI		
200UJ	IRON				40UJ ZINC	1 OM	
3U	LEAD						

59000

MAGNESIUM

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METALS DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51647 SAMPLE TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO ST: FL ** ** STATION ID: SW-08 COLLECTION START: 10/17/90 1605 STOP: 00/00/00 ** .. CASE NUMBER: 15099 SAS NUMBER: MD NUMBER: Y165 ** .. ** ** UG/L **ANALYTICAL RESULTS** UG/L ANALYTICAL RESULTS 1400 **ALUMINUM 52** MANGANESE 240 **ANTIMONY** 0.20U MERCURY 3บั ARSENIC 60 NICKEL BARIUM 6800 20U 1U POTASSIUM BERYLLIUM 1003 SELENIUM 50J 69000 ЗŪ CADMIUM SILVER 160000 CALCIUM SODIUM 6U 4U CHROMIUM 10UR THALLIUM COBALT TIN COPPER **VANADIUM** ЗŬ 350UJ IRON 50UJ ZINC 40 LEAD

MAGNESIUM

42000

^{***}FOOTNOTES***

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METALS DATA REPORT	EPA-KLGION IV CSD, ATHENS, GA.	12/04/90
	CITY: PALMETTO ST: FL	: 00/00/00
UG/L ANALYTICAL RESULTS 27000 ALUMINUM 50U ANTIMONY 30UJ ARSENIC 63 BARIUM 23 BERYLLIUM 130 CADMIUM 670000 CALCIUM 360 CHROMIUM 210 COBALT 20U COPPER 29000J IRON 35 LEAD 200000 MAGNESIUM	UG/L 4100 MANGANESE 0.20U MERCURY 690 NICKEL 160000 POTASSIUM 20UJ SELENIUM 5UJ SILVER 1200000 SODIUM 13J THALLIUM NA TIN 820 VANADIUM 1400J ZINC	* * * * * * * * * * * * * * * * * * * *

^{***}FOOTNOTES***

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METALC D	ATA DEDODT				EPA-	KEGION	IA E2D'	ATH	ENS, GA.				12/04/9	U
METALS DA	ATA REPORT													
*** * * *	F		F 110 C46		# # # C TVDE		- + + -		* * * * * * * *		* * * * * *			
** PRO	JECT NO. 91-0	JZD SAMPL	E NO. 516	DU SAMPL	E IYPE	: SURFA	LEWA	PRUG	ELEM: NSF	COLLECTED	BY: M_GORDON			
** 50UE	RCE: AMAX PHO	SAHAIE LACT	Ŀ					CITA	: PALMETTO ECTION START		ST:_FL			
** STAT	TION ID: SW-1	1						COLLI	ECTION START	: 10/17/90	1445 STOP:	00/00/00		
	NUMBER: 150)99	SAS NUME	ER:				MD 1	NUMBER: Y158				•	*
**														
*** * * *		* * * * *	* * * * *	* * * *			* * *	* * :	* * * * * * *		* * * * * *			1 🛊
UG/L		ANALYTIC	AL RESUL1	5			UG	/L		ANALYTICA	L RESULTS			
300	ALUMINUM						80	•	MANGANESE					
300 240 49 90 10 30	ANTIMONY						0.20	U	MERCURY					
49	ARSENIC						110	•	NICKEL					
ĠĬĬ	BARIUM						8900	n	POTASSIUM					
111	BERYLLIUM						1003		SELENIUM					
ສ່ນັ	CADMIUM						50J		SILVER					
170000	CALCIUM						6500	ΛΛ	SÓDÍÚM					
611	CHROMIUM						10UR		THALLIUM					
411	COBALT						IOUK	NA	TIN					
6U 4U 3U	COPPER						211	MA						
30							30		VANADIUM					
6 001	IRON						40UJ		ZINC					
30	LEAD													
49000	MAGNESIUM													

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN

*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

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PROJECT NO. 91-025 SAMPLE NO. 51680 SAMPLE TYPE: SOIL

SOURCE: AMAX PHOSPHATE FACIL STATION ID: SS-01 CASE.NO.: 15099 SAS

SAS NO.:

PROG ELEM: NSF COLLECTED BY: M GORDON

PROG ELEM: NSF COLLECTED 51. 3

RESULTS UNITS PARAMETER 1.4U MG/KG CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

METALS DATA RE	PORT		THE REGION IT ESD, ATTEMS, GA.	12/04/90
** PROJECT N ** SOURCE: A ** STATION I	IO. 91-025 SAMI	PLE NO. 51642 SAMPLE	TYPE: GROUNDWA PROG ELEM: NSF COLCITY: PALMETTO COLLECTION START: 10 MD NUMBER: Y325	LECTED BY: M GORDON *** ST: FL *** 0/15/90 0630 STOP: 00/00/00 ***
### # # # # # # # # # # # # # # # # #	ANALYTI IINUM MONY NIC UM LLIUM IIUM IIUM MIUM LT ER	ICAL RESULTS	UG/L AN 2U MANGANESE O.20UJ MERCURY 6U NICKEL 72U POTASSIUM 2UJ SELENIUM 5UJ SILVER 50U SODIUM 2UR THALLIUM NA TIN 3U VANADIUM 60U ZINC	ALYTICAL RESULTS

REMARKS RECOMMENDED HOLDING TIME EXCEEDED-HG ***REMARKS***

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

METALS D	ATA REPORT							·-• · • · ·
** * PRO ** SOU ** STA ** CAS	JECT NO. 91-025 RCE: AMAX PHOSE TION ID: SW-01 E NUMBER: 15095	PHATE FACIL	NO. 51674	SAMPLE TYPE	E: SURFACEWA PF C1 C0		COLLECTED BY: M GORDON ST: FL 10/16/90 1330 STOP	
3400 240 240 250 10 30 60 40 70 3500J 5	ALUMINUM ANTIMONY ABSENIC BARIUM BERYLLIUM CADMIUM CHECOM CHROMIUM COBALT COPPER IRON LEAD MAGNESIUM	ANALYTICA	L RESULTS	• • • • •	* * * * * * * * UG/L 20U 0.20U 6U 47000 2UJ 5UJ 110000 10UR 4U 40UJ	MANGANESE MERCURY NICKEL POTASSIUM SELENIUM SILVER	ANALYTICAL RESULTS	

^{***}FOOTNOTES***

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN

*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

PROJECT NO. 91-025 SAMPLE NO. 51685 SAMPLE TYPE: SOIL SOURCE: AMAX PHOSPHATE FACIL STATION ID: SS-02 CASE.NO.: 15099 SAS NO.:

PROG ELEM: NSF COLLECTED BY: M GORDON

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CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 0925 STOP: 00/00/00

D. NO.: Y144

MD NO: Y144

RESULTS UNITS PARAMETER 1.1U MG/KG CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

CASE.NO.: 15099

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PROJECT NO. 91-025 SAMPLE NO. 51689 SAMPLE TYPE: SOIL

PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO

ST: FL

SOURCE: AMAX PHOSPHATE FACIL STATION ID: SS-03

COLLECTION START: 10/17/90 1020 STOP: 00/00/00 D. NO.: Y148 MD NO: Y148

SAS NO.:

RESULTS UNITS PARAMETER 1.2U MG/KG CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

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PROJECT NO. 91-025 SAMPLE NO. 51663 SAMPLE TYPE: SOIL

SOURCE: AMAX PHOSPHATE FACIL STATION ID: SS-04

CASE.NO.: 15099 SAS NO.: PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL

COLLECTION START: 10/18/90 1020 STOP: 00/00/00 D. NO.: Y173 MD NO: Y173

RESULTS UNITS PARAMETER 1.3U MG/KG CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

STATION ID: SS-05 CASE.NO.: 15099

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PROJECT NO. 91-025 SAMPLE NO. 51666 SAMPLE TYPE: SOIL

SOURCE: AMAX PHOSPHATE FACIL

SAS NO.:

PROG ELEM: NSF COLLECTED BY: M GORDON

CITY: PALMETTO ST: FL

CÔLLECTÎON START: 10/18/90 0900 STOP: 00/00/00 D. NO.: Y170 MD NO: Y170

RESULTS UNITS PARAMETER 1.2U MG/KG CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

SAMPLE NO. 51668 SAMPLE TYPE: SOIL

SAS NO.:

PROG ELEM: NSF COLLECTED BY: M GORDON

PROJECT NO. 91-025 SAMPLE SOURCE: AMAX PHOSPHATE FACIL STATION ID: SS-06

ST: FL CITY: PALMETTO COLLECTION START 10/17/90 1205 STOP: 00/00/00

CASE . NO .: 15099 **

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D. NO.: Y152

MD NO: Y152

RESULTS UNITS PARAMETER 1.3U MG/KG CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

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PROJECT NO. 91-025 SAMPLE NO. 51667 SAMPLE TYPE: SOIL

SOURCE: AMAX PHOSPHATE FACIL STATION ID: SS-07 CASE.NO.: 15099 SAS

SAS NO.:

PROG ELEM: NSF COLLECTED BY: M GORDON

CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1150 STOP: 00/00/00

D. NO.: Y153

MD NO: Y153

RESULTS UNITS PARAMETER 1.20 MG/KG CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

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PROJECT NO. 91-025 SAMPLE NO. 51681 SAMPLE TYPE: SOIL SOURCE: AMAX PHOSPHATE FACIL STATION ID: SB-01 CASE.NO.: 15099 SAS NO.:

PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/16/90 1535 STOP: 00/00/00 D. NO.: Y139 MD NO: Y139

RESULTS UNITS PARAMETER 1.3U MG/KG CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

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PROJECT NO. 91-025 SAMPLE NO. 51686 SAMPLE TYPE: SOIL SOURCE: AMAX PHOSPHATE FACIL STATION ID: SB-02 CASE.NO.: 15099 SAS NO.:

PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL

CITY: PALMETTO ST: FL
COLLECTION START: 10/17/90 0945 STOP: 00/00/00
D. NO.: Y145 MD NO: Y145

RESULTS UNITS PARAMETER 1.2U MG/KG CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

PROJECT NO. 91-025 SAMPLE NO. 51671 SAMPLE TYPE: SOIL SOURCE: AMAX PHOSPHATE FACIL STATION ID: SB-03 CASE.NO.: 15099 SAS NO.: PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1135 STOP: 00/00/00 D. NO.: Y149 MD NO: Y149

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> RESULTS UNITS PARAMETER 1.3U MG/KG CYANIDE

FOOTNOTES *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

STATION ID: SB-04

CASE.NO.: 15099

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PROJECT NO. 91-025 SAMPLE NO. 51661 SAMPLE TYPE: SOIL SOURCE: AMAX PHOSPHATE FACIL

SAS NO.:

PROG ELEM: NSF COLLECTED BY: M GORDON

CITY: PALMETTO ST: FL COLLECTION START: 10/18/90 1030 STOP: 00/00/00 D. NO.: Y174 MD NO: Y174

RESULTS UNITS PARAMETER 1.2U MG/KG CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

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SPECIFIED ANALYSIS DATA REPORT

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PROJECT NO. 91-025 SAMPLE NO. 51665 SAMPLE TYPE: SOIL SOURCE: AMAX PHOSPHATE FACIL STATION ID: SB-05 CASE.NO.: 15099 SAS NO.:

PROG ELEM: NSF COLLECTED BY: M GORDON

CITY: PALMETTO ST: FL
COLLECTION START: 10/18/90 0910 STOP: 00/00/00
D. NO.: Y171 MD NO: Y171

RESULTS UNITS PARAMETER 1.2U MG/KG CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

SPECIFIED ANALYSIS DATA REPORT

PROJECT NO. 91-025 SAMPLE NO. 51670 SAMPLE TYPE: SOIL SOURCE: AMAX PHOSPHATE FACIL STATION ID: SB-06 PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1215 STOP: 00/00/00 .. ** ** CASE . NO . : 15099 MD NO: Y155 .. SAS NO.: D. NO.: Y155 **

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> RESULTS UNITS PARAMETER 1.2U MG/KG CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

CASE . NO . : 15099

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PROJECT NO. 91-025 SAMPLE NO. 51678 SAMPLE TYPE: SOIL SOURCE: AMAX PHOSPHATE FACIL STATION ID: SD-02

SAS NO.:

PROG ELEM: NSF COLLECTED BY: M GORDON

CITY: PALMETTO ST: FL

CÔLLECTION START: 10/16/90 1420 STOP: 00/00/00 D. NO.: Y140 MD NO: Y140

RESULTS UNITS PARAMETER 3.20 MG/KG CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

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PROJECT NO. 91-025 SAMPLE NO. 51645 SAMPLE TYPE: SOIL

SAS NO.:

SOURCE: AMAX PHOSPHATE FACIL STATION ID: SD-04 CASE.NO.: 15099

PROG ELEM: NSF COLLECTED BY: M GORDON

CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1630 STOP: 00/00/00 D. NO.: Y166 MD NO: Y166

RESULTS UNITS PARAMETER 1.2U MG/KG CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

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PROJECT NO. 91-025 SAMPLE NO. 51643 SAMPLE TYPE: SOIL SOURCE: AMAX PHOSPHATE FACIL ** **

PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/15/90 1655 STOP: 00/00/00 D. NO.: Y168 MD NO: Y168

STATION ID: SD-05 CASE.NO.: 15099 ** SAS NO.: ** ** **

> RESULTS UNITS PARAMETER 1.50 MG/KG CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

PROJECT NO. 91-025 SAMPLE NO. 51655 SAMPLE TYPE: SOIL SOURCE: AMAX PHOSPHATE FACIL STATION ID: SD-06

PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1445 STOP: 00/00/00

** .. CASE.NO.: 15099

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SAS NO.:

D. NO .: Y156

MD NO: Y156

RESULTS UNITS PARAMETER 1.3U MG/KG CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

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PROJECT NO. 91-025 SAMPLE NO. 51653 SAMPLE TYPE: SOIL

SOURCE: AMAX PHOSPHATE FACIL STATION ID: SD-07 CASE.NO.: 15099 SAS

SAS NO.:

PROG ELEM: NSF COLLECTED BY: M GORDON

CITY: PALMETTO ST: FL
COLLECTION START: 10/17/90 1520 STOP: 00/00/00
D. NO.: Y160 MD NO: Y160

RESULTS UNITS PARAMETER 1.3U MG/KG CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

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PROJECT NO. 91-025 SAMPLE NO. 51648 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON **

SOURCE: AMAX PHOSPHATE FACIL STATION ID: SD-08 CASE.NO.: 15099 SAS CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1610 STOP: 00/00/00 D. NO.: Y164 MD NO: Y164

SAS NO.: ** * * * * **

> RESULTS UNITS PARAMETER 1.5U MG/KG CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

CASE . NO . : 15099

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PROJECT NO. 91-025 SAMPLE NO. 51652 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON **

SAS NO.:

SOURCE: AMAX PHOSPHATE FACIL STATION ID: SD-09

CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1530 STOP: 00/00/00 D. NO.: Y162 MD NO: Y162

RESULTS UNITS PARAMETER 2.2U MG/KG CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

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PROJECT NO. 91-025 SAMPLE NO. 51688 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON

CITY: PALMETTO ST: FL
COLLECTION START: 10/17/90 1045 STOP: 00/00/00
D. NO.: Y150 MD NO: Y150 SOURCE: AMAX PHOSPHATE FACIL STATION ID: SD-10 CASE.NO.: 15099 SAS

SAS NO.: ** ** * * * *

> RESULTS UNITS PARAMETER 1.8U MG/KG CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

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PROJECT NO. 91-025 SAMPLE NO. 51649 SAMPLE TYPE: SOIL SOURCE: AMAX PHOSPHATE FACIL STATION ID: SD-11 CASE.NO.: 15099 SAS NO.:

PROG ELEM: NSF COLLECTED BY: M GORDON

CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1505 STOP: 00/00/00 D. NO.: Y159 MD NO: Y159

RESULTS UNITS PARAMETER 2U MG/KG CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

CASE.NO.: 15099

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PROJECT NO. 91-025 SAMPLE NO. 51669 SAMPLE TYPE: SOIL

SOURCE: AMAX PHOSPHATE FACIL STATION ID: SD-12

SAS NO.:

PROG ELEM: NSF COLLECTED BY: M GORDON

CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1230 STOP: 00/00/00 D. NO.: Y154 MD NO: Y154

RESULTS UNITS PARAMETER 1.6U MG/KG CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

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PROG ELEM: NSF COLLECTED BY: M GORDON PROJECT NO. 91-025 SAMPLE NO. 51683 SAMPLE TYPE: GROUNDWA SOURCE: AMAX PHOSPHATE FACIL STATION ID: TW-01

CITY: PALMETTO ST: FL
COLLECTION START: 10/16/90 1625 STOP: 00/00/00
D. NO.: Y142 MD NO: Y142

CASE NO : 15099 SAS NO.: ** ** **

RESULTS UNITS PARAMETER 10U UG/L CYANIDE

FOOTNOTES *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

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** PROJECT NO. 91-025 SAMPLE NO. 51690 SAMPLE TYPE: GROUNDWA PROG ELEM: NSF COLLECTED BY: M GORDON

SOURCE: AMAX PHOSPHATE FACIL

CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1040 STOP: 00/00/00 D. NO.: Y146 MD NO: Y146 STATION ID: TW-02 CASE NO .: 15099 SAS NO.:

> RESULTS UNITS PARAMETER 10U UG/L CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

SAS NO.:

CASE.NO.: 15099

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PROJECT NO. 91-025 SAMPLE NO. 51684 SAMPLE TYPE: GROUNDWA PROG ELEM: NSF COLLECTED BY: M GORDON

SOURCE: AMAX PHOSPHATE FACIL STATION ID: PW-01

CITY: PALMETTO ST: FL
COLLECTION START. 10/17/90 0935 STOP: 00/00/00
D. NO.: Y147 MD NO: Y147

RESULTS UNITS PARAMETER 10U UG/L CYANIDE

^{*}A-ACTUAL VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

PROJECT NO. 91-025 SAMPLE NO. 51642 SAMPLE TYPE: GROUNDWA PROG ELEM: NSF COLLECTED BY: M GORDON **

SOURCE: AMAX PHOSPHATE FACIL STATION ID: PB-01 CITY: PALMETTO ST: FL COLLECTION START: 10/15/90 0630 STOP: 00/00/00 ** ** MD NO: Y325

CASE.NO.: 15099 SAS NO.: D. NO.: Y325 ** **

RESULTS UNITS PARAMETER 10U UG/L CYANIDE

REMARKS RECOMMENDED HOLDING TIME EXCEEDED-HG ***REMARKS***

FOOTNOTES *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

STATION ID: SD-01

CASE.NO.: 15099

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** ** PROJECT NO. 91-025 SAMPLE NO. 51675 SAMPLE TYPE: SOIL SOURCE: AMAX PHOSPHATE FACIL

SAS NO.:

PROG ELEM: NSF COLLECTED BY: M GORDON

CITY: PALMETTO ST: FL COLLECTION START: 10/16/90 1335 STOP: 00/00/00 D. NO.: Y136 MD NO: Y136

RESULTS UNITS PARAMETER 1.3U MG/KG CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

PROJECT NO. 91-025 SAMPLE NO. 51674 SAMPLE TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON ** * *

SOURCE: AMAX PHOSPHATE FACIL

CITY: PALMETTO ST: FL COLLECTION START: 10/16/90 1330 STOP: 00/00/00 D. NO.: Y137 MD NO: Y137 STATION ID: SW-01 CASE.NO.: 15099 ** SAS NO.: **

RESULTS UNITS PARAMETER 10U UG/L CYANIDE

FOOTNOTES *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

MD NO: Y141

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SPECIFIED ANALYSIS DATA REPORT

PROJECT NO. 91-025 SAMPLE NO. 51677 SAMPLE TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO ST: FL COLLECTION START: 10/16/90 1415 STOP: 00/00/00 ** STATION ID: SW-02 **

D. NO.: Y141 . CASE.NO.: 15099 SAS NO.:

* * **

> RESULTS UNITS PARAMETER 10U UG/L CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

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PROJECT NO. 91-025 SAMPLE SOURCE: AMAX PHOSPHATE FACIL SAMPLE NO. 51646 SAMPLE TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON

CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1620 STOP: 00/00/00 STATION ID: SW-04 ** MD NO: Y167 D. NO.: Y167 ** CASE . NO . : 15099 SAS NO. :

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> RESULTS UNITS PARAMETER 20U UG/L CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

PROJECT NO. 91-025 SAMPLE NO. 51644 SAMPLE TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL
COLLECTION START: 10/17/90 1645 STOP: 00/00/00
D. NO.: Y169 MD NO: Y169 SOURCE: AMAX PHOSPHATE FACIL STATION ID: SW-05 CASE.NO.: 15099 SAS .. **

** SAS NO.: ** ** **

> RESULTS UNITS PARAMETER 100 UG/L CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

PROJECT NO. 91-025 SAMPLE NO. 51656 SAMPLE TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL
COLLECTION START: 10/17/90 1440 STOP: 00/00/00
D. NO.: Y157 MD NO: Y157 SOURCE: AMAX PHOSPHATE FACIL .. ** STATION ID: SW-06

** CASE.NO.: 15099 SAS NO.: ** ** **

> RESULTS UNITS PARAMETER 10U UG/L CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

PROJECT NO. 91-025 SAMPLE NO. 51654 SAMPLE TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON **

SOURCE: AMAX PHOSPHATE FACIL STATION ID: SW-07

CITY: PALMETTO ST: FL
COLLECTION START: 10/17/90 1515 STOP: 00/00/00
D. NO.: Y161 MD NO: Y161

** CASE.NO.: 15099 ** SAS NO.:

RESULTS UNITS PARAMETER 14 UG/L CYANIDE

FOOTNOTES *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

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PROJECT NO. 91-025 SAMPLE NO. 51647 SAMPLE TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1605 STOP: 00/00/00 SOURCE: AMAX PHOSPHATE FACIL ** STATION ID: SW-08 CASE.NO.: 15099 * * ** MD NO: Y165 D. NO.: Y165 SAS NO.: ** **

RESULTS UNITS PARAMETER 100 UG/L CYANIDE

FOOTNOTES *A-ACTUAL VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

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PROJECT NO. 91-025 SAMPLE NO. 51651 SAMPLE TYPE: SURFACEWA SOURCE: AMAX PHOSPHATE FACIL STATION ID: SW-09 SAS NO.: PAGE LEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1515 STOP: D. NO.: Y163 MD NO: Y163 ** ..

CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1515 STOP: 00/00/00 ** **

RESULTS UNITS PARAMETER 10U UG/L CYANIDE

FOOTNOTES *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

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PROJECT NO. 91-025 SAMPLE NO. 51650 SAMPLE TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON ST: FL

SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO STATION ID: SW-11

COLLECTION START: 10/17/90 1445 STOP: 00/00/00 D. NO.: Y158 MD NO: Y158

CASE NO .: 15099 SAS NO.:

> RESULTS UNITS PARAMETER 10U UG/L CYANIDE

FOOTNOTES *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

		ENA-KERION IN EST	J, AIHEI	15, GA.	01/04/91
	ORGANICS DATA REPORT				
** PROJE	CT NO. 91-025 SAMPLE NO. 51680 S CE: AMAX PHOSPHATE FACIL ION ID: SS-01	AMPLE TYPE: SOIL	PROG I	ELEM: NSF COLLECTED BY: M GORD PALMETTO ST: FL CTION START: 10/16/90 1520 ST	ON **
	NO : 15009	SAS NO .	O M) V138	**
*** * * *	NO.: 15099	* * * * * * * * * * * *		* * * * * * * * * * * * * * * * * *	
UG/KG			UG/KG	ANALYTICAL RESULTS	
14U 14U 14U 7U 14U 7U 7U 7U 7U 14U 7U 14U	CHLOROMETHANE BROMOMETHANE VINYL CHLORIDE CHLOROETHANE METHYLENE CHLORIDE ACETONE CARBON DISULFIDE 1.1-DICHLOROETHENE(1.1-DICHLOROETHYL 1.2-DICHLOROETHANE 1.2-DICHLOROETHENE (TOTAL) CHLOROFORM 1.2-DICHLOROETHANE METHYL ETHYL KETONE 1.1.1-TRICHLOROETHANE CARBON TETRACHLORIDE VINYL ACETATE BROMODICHLOROMETHANE	ENE)	7U 7U 7U 7U 7U 7U 14U 7U 7U 7U 7U	1.2-DICHLOROPROPANE CIS-1.3-DICHLOROPROPENE TRICHLOROETHENE(TRICHLOROETHYLE DIBROMOCHLOROMETHANE 1.1.2-TRICHLOROETHANE BENZENE TRANS-1.3-DICHLOROPROPENE BROMOFORM METHYL ISOBUTYL KETONE METHYL BUTYL KETONE TETRACHLOROETHENE(TETRACHLOROETI 1.1.2.2-TETRACHLOROETHANE TOLUENE CHLOROBENZENE ETHYL BENZENE STYRENE TOTAL XYLENES PERCENT MOISTURE	

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

01/04/91

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EXTRACTABLE ORGANICS DATA REPORT
PROJECT NO. 91-025 SAMPLE NO. 51680 SAMPLE TYPE: SOIL
                                                                PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/16/90 1520 STOP: 00/00/00
. .
    SOURCE: AMAX PHOSPHATE FACIL STATION ID: SS-01
* *
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. .
                                                                                                                        ..
                                                                                                                        .
. .
                                   SAS NO.:
   CASE NO.: 15099
                                                                 D. NO.: Y138
                                                                                                                        ..
ANALYTICAL RESULTS
                                                                UG/KG
   UG/KG
                                                                                  ANALYTICAL RESULTS
                                                               4300UR 3-NITROANILINE
   890U PHENOL
   8900 BIS(2-CHLOROETHYL) ETHER
                                                                 890U ACENAPHTHENE
   8900 2-CHLOROPHENOL
                                                                4300U 2,4-DINITROPHENOL
   890U 1,3-DICHLOROBENZENE
                                                                4300U 4-NITROPHENOL
   890U 1,4-DICHLOROBENZENE
                                                                 890U DIBENZOFURAN
890U 2,4-DINITROTOLUENE
   890U BÉNZYL ALCOHOL
   890U 1.2-DICHLOROBENZENE
890U 2-METHYLPHENOL
                                                                 890U DIETHYL PHTHALATE
                                                                 890U 4-CHLOROPHENYL PHENYL ETHER
  890UR BIS(2-CHLOROISOPROPYL) ETHER
                                                                 890U FLUORENE
   890U (3-AND/OR 4-)METHYLPHENOL
                                                                4300U 4-NITROANILINE
   890U N-NITROSODI-N-PROPYLAMINE
                                                                4300U 2-METHYL-4,6-DINITROPHENOL
                                                                 890U N-NITROSODIPHENYLAMINE/DIPHENYLAMINE
   890U HEXACHLOROETHANE
  890UR NITROBENZENE
                                                                 890U 4 BROMOPHENYL PHENYL ETHER
   890U ISOPHORONE
                                                                 890U
                                                                      HEXACHLOROBENZENE (HCB)
   890U 2-NITROPHENOL
                                                                      PENTACHLOROPHENOL
                                                                4300U
   890U 2.4-DIMETHYLPHENOL
                                                                 890U
                                                                      PHENANTHRENE
  4300U BÉNZOIC ACID
                                                                 890U
                                                                      ANTHRACENE
   890U BIS(2-CHLOROETHOXY) METHANE
                                                                 890U
                                                                      DI-N-BUTYLPHTHALATE
   890U 2,4-DICHLOROPHENOL
                                                                 890U
                                                                      FLUORANTHENE
  890UR 1.2.4-TRICHLOROBENZENE
                                                                 890U PYRENE
   890U NAPHTHALENE
                                                                 890U BENZYL BUTYL PHTHALATE
   890U 4-CHLOROANILINE
                                                                1800U 3.3'-DICHLOROBENZIDINE
   890U HEXACHLOROBUTADIENE
                                                                 890U BENZO(A)ANTHRACENE
   890U 4-CHLORO-3-METHYLPHENOL
890U 2-METHYLNAPHTHALENE
                                                                 890U
                                                                      CHRYSENE
                                                                 890U
                                                                      BIS(2-ETHYLHEXYL) PHTHALATE
DI-N-OCTYLPHTHALATE
   890U HEXACHLOROCYCLOPENTADIENE (HCCP)
                                                                 890Ŭ
   890U 2.4.6-TRICHLOROPHENOL
                                                                 890U
                                                                      BENZO(B AND/OR K)FLUORANTHENE
  4300U 2,4,5-TRICHLOROPHENOL
                                                                 890U BENZO-A-PYRENE
  890UR 2-CHLORONAPHTHALENE
                                                                 890U INDENO (1,2,3-CD) PYRENE
  4300U 2-NITROANILINE
                                                                 890U DIBENZO(A, H) ANTHRACENE
                                                                 890U BENZO(GHI)PERYLENE
   890U DIMETHYL PHTHALATE
   890U ACENAPHTHYLENE
                                                                   26 PERCENT MOISTURE
   890U 2.6-DINITROTOLUENE
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REMARKS

REMARKS

F001N01ES

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

01/04/91

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PESTICIDES/PCB'S DATA REPORT
PROG ELEM: NSF COLLECTED BY: M GORDON
   PROJECT NO. 91-025 SAMPLE NO. 51680 SAMPLE TYPE: SOIL
                                                                                                         . .
   SOURCE: AMAX PHOSPHATE FACIL
                                                         CITY: PALMETTO
                                                                               ST: FL
                                                                                                         * *
   STATION ID: SS-01
                                                         COLLECTION START: 10/16/90 1520 STOP: 00/00/00
..
   CASE NUMBER: 15099
                          SAS NUMBER:
                                                          D. NUMBER: Y138
.
                                                                                                         . .
**
                                                                                                         . .
   UG/KG
                   ANALYTICAL RESULTS
                                                         UG/KG
                                                                         ANALYTICAL RESULTS
    22U ALPHA-BHC
                                                         220U METHOXYCHLOR
   22U BETA-BHC
                                                          430
                                                              ENDRIN KETONE
   22U DELTA-BHC
                                                              CHLORDANE (TECH. MIXTURE) /1
       GAMMA-BHC (LINDANE)
                                                         220U
   22U
                                                              GAMMA-CHLORDANE
                                                             ALPHA-CHLORDANE
    22U
       HEPTACHLOR
                                                         220U
   22U
22U
                                                              TOXAPHENE
       ALDRIN
                                                         430U
       HEPTACHLOR EPOXIDE
                                                         220U
                                                              PCB-1016 (AROCLOR 1016)
                                                             PCB-1221 (AROCLOR 1221)
PCB-1232 (AROCLOR 1232)
   22U
       ENDOSULFAN I (ALPHA)
                                                         220U
       DIELDRIN
                                                         220Ŭ
    43U
       4.4 - BOE (P.P'-DDE)
    43U
                                                         220U
                                                              PCB-1242 (AROCLOR 1242)
       ENDRIN
    43U
                                                         220U
                                                              PCB-1248 (AROCLOR 1248)
       ENDOSULFAN II (BETA)
    43U
                                                         430U PCB-1254 (AROCLOR 1254)
       4,4' DDD (P,P' DDD)
                                                         430U PCB- 1260 (AROCLOR 1260)
    43U
   43U ENDOSULFAN SULFATE
                                                          26
                                                             PERCENT MOISTURE
   43U 4.4'-00T (P.P'-00T)
```

REMARKS

REMARKS

^{*}A-AVERAGE VALUE •NAI-INTERFERENCES •J-ESTIMATED VALUE •N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *NA-NOT ANALYZED •K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN •U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

^{*}R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION. *C-CONFIRMED BY GCMS 1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

01/04/91

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MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT

PROJECT NO. 91-025 SAMPLE NO. 51680 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON ..

SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO ST: FL

COLLECTION START: 10/16/90 1520 STOP: 00/00/00 STATION ID: SS-01 MD NO: Y138 D. NO.: Y138

CASE.NO.: 15099 SAS NO.:

ANALYTICAL RESULTS UG/KG

£0008 5 UNIDENTIFIED COMPOUNDS

FOOTNOTES

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^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

01/04/91

PURGEABLE ORGANICS DATA REPORT	CDD, ATTICNO, GA.	01/04/91
** PROJECT NO. 91-025 SAMPLE NO. 51685 SAMPLE TYPE: SOIL	PROG ELEM: NSF COLLECTED BY: M GORDON	**
** SOURCE: AMAX PHOSPHATE FACIL	CITY: PALMETTO ST: FL	••
** STATION ID: SS-02	COLLECTION START: 10/17/90 0925 STOP: 00	
**	000000110N START: 10/11/30 0323 STOF: 00	,00,00
** CASE NO.: 15099 SAS NO.:	D. NO.: Y144	
*** * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * * *	
UG/KG ANALYTICAL RESULTS	UG/KG ANALYTICAL RESULTS	
04,114	AMPETITIONE RESOLTS	
11U CHLOROMETHANE	5U 1,2-DICHLOROPROPANE	
11U BROMOMETHANE	5U CIS-1,3-DICHLOROPROPENE	
110 VINYL CHLORIDE	5U TRICHLOROETHENE (TRICHLOROETHYLENE)	
110 CHLOROETHANE	5U DIBROMOCHLOROMETHANE	
ŚŬ METHYLENE CHLORIDE	5U 1,1,2-TRICHLOROETHANE	
11U ACETONE	5U BENZENE	
SU CARBON DISULFIDE	5U TRANS-1,3-DICHLOROPROPENE	
ŠŪ 1,1-DICHLOROETHENE(1,1-DICHLOROETHYLENE)	5U BROMOFORM	
ŠŪ 1,1-DICHLOROETHANE	11U METHYL ISOBUTYL KETONE	
ŠŪ 1.2-DICHLOROETHENE (TOTAL)	11U METHYL BUTYL KETONE	
5U 1.2-DICHLOROETHENE (TOTAL) 5U CHLOROFORM	5U TETRACHLOROETHENE (TETRACHLOROETHYLENE)
5U 1,2-DICHLOROETHANE	5U 1,1,2,2-TETRACHLOROETHANE	•
11U MÉTHYL ETHYL KETONE	2J TOLUENE	
5U 1,1,1-TRICHLOROETHANE	5U CHLOROBENZENE	
5U CARBON TETRACHLORIDE	5U ETHYL BENZENE	
11U VINYL ACETATE	5U STYRENE	
5U BROMODICHLOROMETHANE	5U TOTAL XYLENES	
	8 PERCENT MOISTURE	

REMARKS

REMARKS

FOOTNOTES *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

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EXTRACTABLE ORGANICS DATA REPORT
PROJECT NO. 91-025 SAMPLE NO. 51685 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON SOURCE: AMAX PHOSPHATE FACIL ST: FL
..
                                                                                 CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 0925 STOP: 00/00/00
                                                                                                                                                      ..
     STATION ID: SS-02
..
                                                                                                                                                     ..
**
                                                                                                                                                     ..
    CASE NO.: 15099
                                                      SAS NO.:
                                                                                  D. NO.: Y144
. .
                                                                                                                                                     . .
ANALYTICAL RESULTS
                                                                                UG/KG
    UG/KG
                                                                                                       ANALYTICAL RESULTS
                                                                              3500UR 3-NITROANILINE
720U ACENAPHTHENE
3500U 2.4-DINITROPHENOL
3500U 4-NITROPHENOL
720U DIBENZOFURAN
    720U PHENOL
    720U BIS(2-CHLOROETHYL) ETHER
720U 2-CHLOROPHENOL
           1.3-DICHLOROBENZENE
    720U
    720U 1.4-DICHLOROBENZENE
    720U BENZYL ALCOHOL
720U 1,2-DICHLOROBENZENE
                                                                                 720U 2,4-DINITROTOLUENE
                                                                                 7200 DIETHYL PHTHALATE
    720U 2-METHYLPHENOL
                                                                                 720U 4-CHLOROPHENYL PHENYL ETHER
   720UR BIS(2-CHLOROISOPROPYL) ETHER
                                                                                 720U FLUORENE
   720U (3-AND/OR 4-)METHYLPHENOL
720U N-NITROSODI-N-PROPYLAMINE
720U HEXACHLOROETHANE
720UR NITROBENZENE
                                                                               3500U 4-NITROANILINE
3500U 2-METHYL-4.6-DINITROPHENOL
720U N-NITROSODIPHENYLAMINE/DIPHENYLAMINE
720U 4-BROMOPHENYL PHENYL ETHER
    720U ISOPHORONE
                                                                                 720U HEXACHLOROBENZENE (HCB)
    720U 2-NITROPHENOL
                                                                                3500U PENTACHLOROPHENOL
    720U 2,4-DIMETHYLPHENOL
                                                                                 720U PHENANTHRENE
                                                                                 720U ANTHRACENE
   3500U BÉNZOIC ACID
   720U BIS(2-CHLOROETHOXY) METHANE
720U 2.4-DICHLOROPHENOL
720UR 1.2.4-TRICHLOROBENZENE
720U NAPHTHALENE
                                                                                 720U DI-N-BUTYLPHTHALATE
                                                                                 720U FLUORANTHENE
                                                                                 720U PYRENE
720U BENZYL
                                                                                        BENZYL BUTYL PHTHALATE
                                                                                1400U 3.3'-DICHLOROBENZIDINE
720U BENZO(A)ANTHRACENE
    720U 4-CHLOROANILINE
    720U HEXACHLOROBUTADIENE
720U 4-CHLORO-3-METHYLPHENOL
                                                                                 720Ú CHRÝSĚNĚ
    720U 2-METHYLNAPHTHALENE
                                                                                 720U BIS(2-ETHYLHEXYL) PHTHALATE
720U DI-N-OCTYLPHTHALATE
    720U HEXACHLOROCYCLOPENTADIENE (HCCP)
   720U 2.4,6-TRICHLOROPHENOL
3500U 2.4.5-TRICHLOROPHENOL
720UR 2-CHLORONAPHTHALENE
                                                                                 720U BENZO(B AND/OR K)FLUORANTHENE
                                                                                 720U
                                                                                        BENZO-A-PYRENE
                                                                                 720U INDENO (1,2,3-CD) PYRENE
720U DIBENZO(A,H)ANTHRACENE
   3500U
           2-NITROANILINE
    720U DIMETHYL PHTHALATE
                                                                                 720U BENZO(GHI)PÉRYLENE
    720U ACENAPHTHYLENE
                                                                                       PERCENT MOISTURE
    720U 2,6-DINITROTOLUENE
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REMARKS

REMARKS

^{*}NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

^{*}K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

^{*}R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

01/04/91

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PESTICIDES/PCB'S DATA REPORT
PROJECT NO. 91-025
                    SAMPLE NO. 51685 SAMPLE TYPE: SOIL
                                                           PROG ELEM: NSF COLLECTED BY: M GORDON
    SOURCE: AMAX PHOSPHATE FACIL
                                                           CITY: PALMETTO
                                                                                  ST: FL
..
                                                                                                             ..
    STATION ID: SS-02
                                                           COLLECTION START: 10/17/90 0925 STOP: 00/00/00
..
                                                                                                            ..
                           SAS NUMBER:
                                                           D. NUMBER: Y144
    CASE NUMBER: 15099
* *
                                                                                                            * *
..
                                                                                                            . .
   UG/KG
                    ANALYTICAL RESULTS
                                                           UG/KG
                                                                           ANALYTICAL RESULTS
    17U ALPHA-BHC
                                                           170U
                                                               METHOXYCHLOR
    17U BETA-BHC
                                                            350
                                                                ENDRIN KETONE
    17U DELTA-BHC
                                                                CHLORDANE (TECH. MIXTURE) /1
    17U GAMMA-BHC (LINDANE)
17U HEPTACHLOR
                                                            45J
                                                                GAMMA-CHLORDANE
                                                                ALPHA-CHLORDANE
                                                            52J
                                                                TOXAPHENE
    17U ALDRIN
                                                           350U
        HEPTACHLOR EPOXIDE
                                                               PCB-1016 (AROCLOR 1016)
PCB-1221 (AROCLOR 1221)
    17U
                                                           1700
    1 7 U
        ENDOSULFAN I (ALPHA)
                                                           170U
    35U DIELDRIN
                                                           170U
                                                                PCB-1232 (AROCLOR 1232)
    39 4,4'-DDE (P,P'-DDE)
                                                                PCB-1242 (AROCLOR 1242)
                                                           1700
    35U ENDRIN
                                                           170U
                                                                PCB-1248 (AROCLOR 1248)
        ENDOSULFAN II (BETA)
4,4' DDD (P.P' DDD)
                                                                PCB-1254 (AROCLOR 1254)
    35U
                                                           350U
                                                           3500
                                                                PCB-1260 (AROCLOR 1260)
    35U
        ENDOSULFAN SULFATE
                                                               PERCENT MOISTURE
    35U
        4.4'-DDT (P.P'-DDT)
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REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN

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*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

*C-CONFIRMED BY GCMS

1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

01/04/91

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MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT

PROJECT NO. 91-025 SAMPLE NO. 51685 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON ** ..

SOURCE: AMAX PHOSPHATE FACIL STATION ID: SS-02 CASE.NO.: 15099 SAS CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 0925 STOP: 00/00/00 D. NO.: Y144 MD NO: Y144 SAS NO.:

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ANALYTICAL RESULTS UG/KG

PETROLEUM PRODUCT 3000UP 2 UNIDENTIFIED COMPOUNDS

FOOTNOTES

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^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT. *R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

01/04/91

PESTICIDES/PCB'S DATA REPORT .	LFA-REGION IV ESD, ATTENS, GA.	01/04/91
*** * * * * * * * * * * * * * * * * *		
** PROJECT NO. 91-025 SAMPLE NO. 51689 SAMPLE ** SOURCE: AMAX PHOSPHATE FACIL ** STATION ID: SS-03 ** CASE NUMBER: 15099 SAS NUMBER:	E TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL	**
UG/KG ANALYTICAL RESULTS	UG/KG ANALYTICAL RESULTS	
20U ALPHA-BHC 20U BETA-BHC 20U DELTA-BHC 20U GAMMA-BHC (LINDANE) 20U HEPTACHLOR 20U ALDRIN 20U HEPTACHLOR EPOXIDE 20U ENDOSULFAN I (ALPHA) 40U DIELDRIN 40U 4.4'-DDE (P.P'-DDE) 40U ENDRIN 40U ENDRIN 40U 4,4' DDD (P.P' DDD) 40U ENDOSULFAN SULFATE 40U 4,4'-DDT (P.P'-DDT)	200U METHOXYCHLOR 40U ENDRIN KETONE CHLORDANE (TECH. MIXTURE) /1 200U GAMMA-CHLORDANE /2 200U ALPHA-CHLORDANE /2 400U TOXAPHENE 200U PCB-1016 (AROCLOR 1016) 200U PCB-1221 (AROCLOR 1221) 200U PCB-1232 (AROCLOR 1232) 200U PCB-1242 (AROCLOR 1242) 200U PCB-1248 (AROCLOR 1248) 400U PCB-1254 (AROCLOR 1254) 400U PCB-1260 (AROCLOR 1260) 20 PERCENT MOISTURE	

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT. *R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION. *C-CONFIRMED BY GCMS 1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

01/04/91

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MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT

PROJECT NO. 91-025 SAMPLE NO. 51689 SAMPLE TYPE: SOIL SOURCE: AMAX PHOSPHATE FACIL STATION ID: SS-03 CASE.NO.: 15099 SAS

SAS NO.:

PROG ELEM: NSF COLLECTED BY: M GORDON

CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1020 STOP: 00/00/00

D. NO.: Y148

MD NO: Y148

ANALYTICAL RESULTS UG/KG

60004 6 UNIDENTIFIED COMPOUNDS

FOOTNOTES

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^{*}NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *A-AVERAGE VALUE *NA-NOT ANALYZED

^{*}A-AVERAGE VALUE IS *NA-NUT ANALYZED **NAI-INTERFERENCES *J-ESTIMATED VALUE IS *NOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

DUDGEARIE ODGANICE DATA DEDORT	EPA-REGION IV ESU, ATHENS, GA,	01/04/91
PURGEABLE ORGANICS DATA REPORT		
PROJECT NO. 91-025 SAMPLE NO. 51689 SAMPLE SOURCE: AMAX PHOSPHATE FACIL STATION ID: SS-03	TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL	00/00/00
** CASE NO.: 15099 SAS	NO.: D. NO.: Y148	• •
UG/KG ANALYTICAL RESULTS		
13U CHLOROMETHANE 13U BROMOMETHANE 13U VINYL CHLORIDE 13U CHLOROETHANE 6U METHYLENE CHLORIDE 13U ACETONE 6U CARBON DISULFIDE 6U 1,1-DICHLOROETHENE(1,1-DICHLOROETHYLENE) 6U 1,2-DICHLOROETHANE 6U 1,2-DICHLOROETHANE 6U CHLOROFORM 6U 1,2-DICHLOROETHANE 13U METHYL ETIYL KETONE 6U 1,1-TRICHLOROETHANE 6U CARBON TETRACHLORIDE 13U VINYL ACETATE 6U BROMODICHLOROMETHANE	6U 1,2-DICHLOROPROPANE 6U CIS-1,3-DICHLOROPROPENE 6U TRICHLOROETHENE(TRICHLOROETHYLENE) 6U DIBROMOCHLOROMETHANE 6U 1,1,2-TRICHLOROETHANE 6U BENZENE 6U TRANS-1,3-DICHLOROPROPENE 6U BROMOFORM 13U METHYL ISOBUTYL KETONE 13U METHYL BUTYL KETONE 6U TETRACHLOROETHENE(TETRACHLOROETHYLE) 6U 1,1,2,2-TETRACHLOROETHANE 6U TOLUENE 6U CHLOROBENZENE 6U ETHYL BENZENE 6U STYRENE 6U TOTAL XYLENES 20 PERCENT MOISTURE	ENE)

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
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01/04/91 EXTRACTABLE ORGANICS DATA REPORT PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1020 STOP: 00/00/00 PROJECT NO. 91-025 SAMPLE NO. 51689 SAMPLE TYPE: SOIL SOURCE: AMAX PHOSPHATE FACIL ** * * STATION ID: SS-03 SAS NO.: D NO.: Y148 CASE NO.: 15099 . ANALYTICAL RESULTS UG/KG ANALYTICAL RESULTS 4000UR 3-NITROANILINE 820U ACENAPHTHENE 4000U 2,4-DINITROPHENOL 820U PHENOL 820U BIS(2-CHLOROETHYL) ETHER 820U 2-CHLOROPHENOL 820U 1.3-DICHLOROBENZENE 4000U 4-NITROPHENOL 820U 1,4-DICHLOROBENZENE 820U DIBENZOFURAN 820U BENZYL ALCOHOL 820U 2,4-DINITROTOLUENE 820U 1,2-DICHLOROBENZENE 820U DIETHYL PHTHALATE 820U 2-METHYLPHENOL 820U 4-CHLOROPHENYL PHENYL ETHER 820U FLUORENE
4000U 4-NITROANILINE
4000U 2-METHYL-4,6-DINITROPHENOL
820U N-NITROSODIPHENYLAMINE/DIPHENYLAMINE
820U 4-BROMOPHENYL PHENYL ETHER 820UR BIS(2-CHLOROISOPROPYL) ETHER 820U (3-AND/OR 4-)METHYLPHENOL 820U N-NITROSODI-N-PROPYLAMINE 820U 820U HEXACHLOROETHANE 820UR NITROBENZENE 820U ISOPHORONE 820U HEXACHLOROBENZENE (HCB) 8200 2-NITROPHENOL 4000U PENTACHLOROPHENOL 820U 2.4-DIMETHYLPHENOL 820U PHENANTHRENE 4000U BENZOIC ACID 820U BIS(2-CHLOROETHOXY) METHANE 820U 2,4-DICHLOROPHENOL 820UR 1.2.4-TRICHLOROBENZENE 820U ANTHRACENE 820U DI-N-BUTYLPHTHALATE 820U FLUORANTHENE 820U PYRENE 820U NAPHTHALENE 820U BENZYL BUTYL PHTHALATE 820U 4-CHLOROANILINE 820U HEXACHLOROBUTADIENE 1600U 3.3'-DICHLOROBENZIDINE 820U BENZO(A)ANTHRACENE 820U 4-CHLORO-3-METHYLPHENOL 820U CHRYSENE 820U 2-METHYLNAPHTHALENE 820U BIS(2-ETHYLHEXYL) PHTHALATE 820U DI-N-OCTYLPHTHALATE 820U HEXACHLOROCYCLOPENTADIENE (HCCP) 2.4.6-TRICHLOROPHENOL 2.4.5-TRICHLOROPHENOL 820U BENZO(B AND/OR K)FLUORANTHENE 820U 4000U 820U BENZO-A-PYRENE 2-CHLORONAPHIHALENE 2-NITROANILINE 820U INDENO (1.2.3-CD) PYRENE 820U DIBENZO(A.H)ANTHRACENE 820UR 4000U 820U DIMETHYL PHTHALATE 820U BENZO(GHI)PERYLENE 820U ACENAPHTHYLENE 20 PERCENT MOISTURE

REMARKS

REMARKS

FOOTNOTES

820U 2.6-DINITROTOLUENE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

[•]R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

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PROJECT NO. 91-025 SAMPLE NO. 51676 SAMPLE TYPE: GROUNDWA SOURCE: AMAX PHOSPHATE FACIL STATION ID: MW-05 CASE.NO.: 15099 SAS NO.: PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO COLLECTION START: 10/16/90 1350 STOP: D. NO.: Y329 MD NO: Y329 CITY: PALMETTO ST: FL COLLECTION START: 10/16/90 1350 STOP: 00/00/00 D. NO.: Y329 MD NO: Y329 ** **

RESULTS UNITS PARAMETER 10UJ UG/L CYANIDE

REMARKS HOLDING TIME EXCEEDED-CN ***REMARKS***

^{***}FOOTNOTES*** *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

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PROJECT NO. 91-025 SAMPLE NO. 51682 SAMPLE TYPE: GROUNDWA SOURCE: AMAX PHOSPHATE FACIL STATION ID: MW-06 COLLECTED BY: M GORDON PROG ELEM: NSF

CITY: PALMETTO ST: FL COLLECTION START: 10/16/90 1615 STOP: 00/00/00 MD NO: Y143 CASE.NO.: 15099 SAS NO.: D. NO.: Y143

** ** ** **

> RESULTS UNITS PARAMETER 10U UG/L CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

01/04/91

PURGEABLE ORGANICS DATA REPORT	LYA KEGION IV ESD, ATTIENS, GA.	01/04/91
PROJECT NO. 91-025 SAMPLE NO. 51663 SAMPLE SOURCE: AMAX PHOSPHATE FACIL STATION ID: SS-04		00/00/00
	NO.: D. NO.: Y173 UG/KG ANALYTICAL RESULTS	**
13U CHLOROMETHANE 13U BROMOMETHANE 13U VINYL CHLORIDE 13U CHLOROETHANE 10U METHYLENE CHLORIDE 13U ACETONE 7U CARBON DISULFIDE 7U 1,1-DICHLOROETHENE(1.1-DICHLOROETHYLENE) 7U 1,2-DICHLOROETHANE 7U 1,2-DICHLOROETHANE 7U CHLOROFORM 7U 1,2-DICHLOROETHANE 13U METHYL ETHYL KETONE 7U 1,1-TRICHLOROETHANE 13U METHYL ETHYL KETONE 7U CARBON TETRACHLORIDE 13U VINYL ACETATE 7U BROMODICHLOROMETHANE	7U 1,2-DICHLOROPROPANE 7U CIS-1,3-DICHLOROPROPENE 7U TRICHLOROETHENE (TRICHLOROETHYLENE) 7U DIBROMOCHLOROMETHANE 7U 1,1,2-TRICHLOROETHANE 7U TRANS-1,3-DICHLOROPROPENE 7U BROMOFORM 13U METHYL ISOBUTYL KETONE 13U METHYL BUTYL KETONE 7U TETRACHLOROETHENE (TETRACHLOROETHYLEN) 7U TETRACHLOROETHENE (TETRACHLOROETHYLEN) 7U TOLUENE 7U CHLOROBENZENE 7U ETHYL BENZENE 7U STYRENE 7U TOTAL XYLENES 25 PERCENT MOISTURE	NE)

REMARKS

REMARKS

FOOTNOTES *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
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*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

01/04/91

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EXTRACTABLE ORGANICS DATA REPORT
PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/18/90 1020 STOP: 00/00/00
    PROJECT NO. 91-025 SAMPLE NO. 51663 SAMPLE TYPE: SOIL
                                                                                                                          . .
    SOURCE: AMAX PHOSPHATE FACIL
..
                                                                                                                          **
    STATION ID: SS-04
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. .
                                                                                                                          * *
                                            SAS NO.:
                                                                   D. NO.: Y173
   CASE NO.: 15099
                                                                                                                          *#
UG/KG
                    ANALYTICAL RESULTS
                                                                 UG/KG
                                                                                    ANALYTICAL RESULTS
                                                                4300UR 3-NITROANILINE
880UR ACENAPHTHENE
4300U 2,4-DINITROPHENOL
   880U PHENOL
   880U BIS(2-CHLOROETHYL) ETHER
880U 2-CHLOROPHENOL
   880U 1,3-DICHLOROBENZENE
                                                                 4300U 4-NITROPHENOL
   880U 1.4-DICHLOROBENZENE
                                                                  880U DIBENZOFURAN
   880U BENZYL ALCOHOL
                                                                  880U 2.4-DINITROTOLUENE
   880U 1.2-DICHLOROBENZENE
                                                                  880U DIETHYL PHTHALATE
   880U 2-METHYLPHENOL
                                                                  880U 4-CHLOROPHENYL PHENYL ETHER
  880UR BIS(2-CHLOROISOPROPYL) ETHER
                                                                  880U FLUORENE
   880U (3-AND/OR 4-)METHYLPHENOL
                                                                 4300U 4-NITROANILINE
   880U N-NITROSODI-N-PROPYLAMINE
                                                                 4300U 2-METHYL-4.6-DINITROPHENOL
880U N-NITROSODIPHENYLAMINE/DIPHENYLAMINE
   880U HEXACHLOROETHANE
  880UR NITROBENZENE
                                                                  880U 4 BROMOPHENYL PHENYL ETHER
   880U ISOPHORONE
                                                                  880U HEXACHLOROBENZENE (HCB)
   880U 2-NITROPHENOL
                                                                 4300U PENTACHLOROPHENOL
   880U 2.4-DIMETHYLPHENOL
                                                                  880U PHENANTHRENE
  4300U BENZOIC ACID
                                                                  880U ANTHRACENE
                                                                  880U DI-N-BUTYLPHTHALATE
   880U BIS(2-CHLOROETHOXY) METHANE
   880U 2,4-DICHLOROPHENOL
                                                                  880U
                                                                       FLUORANTHENE
  880UR 1.2.4-TRICHLOROBENZENE
880U NAPHTHALENE
                                                                  880U
                                                                       PYRENE
                                                                  8800
                                                                       BENZYL BUTYL PHTHALATE
   880U 4-CHLOROANILINE
                                                                       3.3'-DICHLOROBENZIDINE
                                                                 1800U
   880U HEXACHLOROBUTADIENE
                                                                       BENZO(A)ANTHRACENE
                                                                  880U
   880U 4-CHLORO-3-METHYLPHENOL
                                                                  880U
                                                                       CHRYSENE
   880U 2-METHYLNAPHTHALENE
                                                                  880U BIS(2-ETHYLHEXYL) PHTHALATE
   880U HEXACHLOROCYCLOPENTADIENE (HCCP)
                                                                  880U DI-N-OCTYLPHTHALATE
   880U 2.4.6-TRICHLOROPHENOL
                                                                  880U BENZO(B AND/OR K)FLUORANTHENE
                                                                       BENZO-A-PYRENE
  4300U 2.4.5-TRICHLOROPHENOL
                                                                  880U
  880UR 2-CHLORUNAPHTHALENE
                                                                  8800
                                                                       INDENO (1,2,3-CD) PYRENE
DIBENZO(A,H)ANTHRACENE
        2-NITROANILINE
  4300U
                                                                  880U
   880U DIMETHYL PHTHALATE
                                                                       BENZO(GHI)PERYLENE
                                                                  880U
   880U ACENAPHTHYLENE
                                                                       PERCENT MOISTURE
   880U 2.6-DINITROTOLUENE
```

REMARKS

REMARKS

FOOTNOTES *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

01/04/91

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PESTICIDES/PCB'S DATA REPORT
PROJECT NO. 91-025 SAMPLE NO. 51663 SAMPLE TYPE: SOIL
                                                         PROG ELEM: NSF COLLECTED BY: M GORDON
    SOURCE: AMAX PHOSPHATE FACIL
                                                                               ST: FL
                                                         CITY: PALMETTO
..
                                                                                                         * *
    STATION ID: 55-04
                                                         COLLECTION START: 10/18/90 1020 STOP: 00/00/00
                                                                                                         . .
..
   CASE NUMBER: 15099
                           SAS NUMBER:
                                                         D. NUMBER: Y173
. .
                                                                                                         * *
   UG/KG
                   ANALYTICAL RESULTS
                                                         UG/KG
                                                                         ANALYTICAL RESULTS
    21U ALPHA-BHC
                                                         210U METHOXYCHLOR
   210 BETA-BHC
210 DELTA-BHC
                                                          42U
                                                             ENDRIN KETONE
                                                              CHLORDANE (TECH. MIXTURE) /1
       DELTA-BHC
       GAMMA-BHC (LINDANE)
                                                             GAMMA-CHLORDANE
    210
                                                         210U
       HEPTACHLOR
                                                         2100
                                                              ALPHA-CHLORDANE
    210
    210
       ALDRIN
                                                         420U
                                                             TOXAPHENE
                                                             PCB-1016 (AROCLOR 1016)
PCB-1221 (AROCLOR 1221)
    21U HEPTACHLOR EPOXIDE
                                                         210U
       ENDOSULFAN I (ALPHA)
    210
                                                         210U
    42U DIELDRIN
                                                         210U
                                                             PCB-1232 (AROCLOR 1232)
                                                         2100
2100
    42U 4,4'-DDE (P.P'-DDE)
                                                             PCB-1242 (AROCLOR 1242)
    42U ENDRIN
                                                             PCB-1248 (AROCLOR 1248)
                                                             PCB-1254 (AROCLOR 1254)
    42U ENDOSULFAN II (BETA)
                                                         420U
       4,4' DDD (P.P' DDD)
    42Ú
                                                         420U
                                                             PCB 1260 (AROCLOR 1260)
    42U ENDOSULFAN SULFATE
                                                             PERCENT MOISTURE
       4,4'-DDT (P,P'-DDT)
    42U
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REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REALYSIS IS NECESSARY FOR VERIFICATION.

^{*}C-CONFIRMED BY GCMS 1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

01/04/91

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MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT

PROJECT NO. 91-025 SAMPLE NO. 51663 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON ** ..

**

SOURCE: AMAX PHOSPHATE FACIL STATION ID: SS-04 CASE.NO.: 15099 SAS CITY: PALMETTO ST: FL COLLECTION START: 10/18/90 1020 STOP: 00/00/00 D. NO.: Y173 MD NO: Y173 SAS NO.: * *

ANALYTICAL RESULTS UG/KG

3000J 2 UNIDENTIFIED COMPOUNDS

FOOTNOTES

* *

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

01/04/91

PURGEABLE ORGANICS DATA REPORT	GION IV ESD, AINENS, GA.	01/04/91
*** * * * * * * * * * * * * * * * * *	CITY: PALMETTO ST: FL	00/00/00
CASE NO.: 15099 UG/KG ANALYTICAL RESULTS	D. NO.: Y170 UG/KG ANALYTICAL RESULTS	**********
12U CHLOROMETHANE 12U BROMOMETHANE 12U VINYL CHLORIDE 12U CHLOROETHANE 6U METHYLENE CHLORIDE 12U ACETONE 6U CARBON DISULFIDE 6U 1,1-DICHLOROETHENE(1,1-DICHLOROETHYLENE) 6U 1,2-DICHLOROETHANE 6U 1,2-DICHLOROETHENE (TOTAL) 6U CHLOROFORM 6U 1,2-DICHLOROETHANE 12U METHYL ETHYL KETONE 6U 1,1-TRICHLOROETHANE 6U 0,1,1-TRICHLOROETHANE 6U 0,1,1-TRICHLOROETHANE 6U 0,1,1-TRICHLOROETHANE 6U 0,1,1-TRICHLOROETHANE 6U 0ARBON TETRACHLORIDE 12U VINYL ACETATE 6U BROMODICHLOROMETHANE	6U 1,2-DICHLOROPROPANE 6U CIS-1,3-DICHLOROPROPENE 6U TRICHLOROETHENE(TRICHLOROETHYLENE) 6U DIBROMOCHLOROMETHANE 6U BÉNZENE 6U TRANS-1,3-DICHLOROPROPENE 6U BROMOFORM 12U METHYL ISOBUTYL KETONE 12U METHYL BUTYL KETONE 6U TETRACHLOROETHENE(TETRACHLOROETHYLE) 6U 1,1,2,2-TETRACHLOROETHANE 1J TOLUENE 6U CHLOROBENZENE 6U CHLOROBENZENE 6U STYRENE 6U TOTAL XYLENES 14 PERCENT MOISTURE	NE)

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

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EXTRACTABLE ORGANICS DATA REPORT
*** PROJECT NO. 91-025 SAMPLE NO. 51666 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON **

COURSE: AMAY DISCOURTE FACTI
     SOURCE: AMAX PHOSPHATE FACIL
                                                                        CITY: PALMETTO ST: FL
COLLECTION START: 10/18/90 0900 STOP: 00/00/00
                                                                        CITY: PALMETTO
                                                                                                                                     .
     STATION ID: SS-05
..
                                                                                                                                     .
**
                                                                                                                                     **
                                                SAS NO.:
                                                                         D. NO.: Y170
    CASE NO.: 15099
**
                                                                                                                                     .
ANALYTICAL RESULTS
                                                                       UG/KG
    UG/KG
                                                                                           ANALYTICAL RESULTS
                                                                      3700UR 3-NITROANILINE
    770U PHENOL
    770U BIS(2-CHLOROETHYL) ETHER
770U 2-CHLOROPHENOL
                                                                       77OUR ACENAPHTHENE
                                                                       3700U 2.4-DINITROPHENOL 3700U 4-NITROPHENOL
    770U 1.3-DICHLOROBENZENE
                                                                        770U DIBENZOFURAN
    770U 1.4-DICHLOROBENZENE
    770U BENZYL ALCOHOL
                                                                        770U 2,4-DINITROTOLUENE
    770U 1,2-DICHLOROBENZENE
                                                                        770U DIETHYL PHTHALATE
                                                                        770U 4-CHLOROPHENYL PHENYL ETHER
    770U 2-METHYLPHENOL
   77OUR BIS(2-CHLOROISOPROPYL) ETHER
                                                                        7700 FLUORENE
    770U (3-AND/OR 4-)METHYLPHENOL
                                                                       3700U 4-NITROANILINE
                                                                       3700U 2-METHYL-4.6-DINITROPHENOL
770U N-NITROSODIPHENYLAMINE/DIPHENYLAMINE
770U 4-BROMOPHENYL PHENYL ETHER
    770U N-NITROSODI-N-PROPYLAMINE
    770U HEXACHLOROETHANE
   77OUR NITROBENZENE
    770U ISOPHORONE
                                                                        770U
                                                                              HEXACHLOROBENZENE (HCB)
    770U 2-NITROPHENOL
                                                                       37000
                                                                              PENTACHLOROPHENOL
    770Ŭ
         2.4-DIMETHYLPHENOL
                                                                        770U
                                                                              PHENANTHRENE
   3700U BENZOIC ACID
                                                                        7700
                                                                              ANTHRACENE
    770U BIS(2-CHLOROETHOXY) METHANE
                                                                              DI-N-BUTYLPHTHALATE
                                                                        120J
    770U 2,4-DICHLOROPHENOL
                                                                        770Ŭ
                                                                              FLUORANTHENE
   770UR 1,2.4-TRICHLOROBENZENE
                                                                              PYRENE
                                                                        770U
    7700
         NAPHTHALENE
                                                                        770U
                                                                              BENZYL BUTYL PHTHALATE
                                                                              3.3'-DICHLOROBENZIDINE
BENZO(A)ANTHRACENE
    770U 4-CHLOROANILINE
                                                                       1500U
    770U HEXACHLOROBUTADIENE
                                                                        770U
    770U 4-CHLORO-3-METHYLPHENOL
770U 2-METHYLNAPHTHALENE
                                                                        770U
                                                                              CHRYSENE
                                                                        770U
                                                                              BIS(2-ETHYLHEXYL) PHTHALATE
                                                                        770U DI-N-OCTYLPHTHALATE
    770U HEXACHLOROCYCLOPENTADIENE (HCCP)
   770U 2.4.6-TRICHLOROPHENOL
3700U 2.4.5-TRICHLOROPHENOL
                                                                        770U BENZO(B AND/OR K)FLUORANTHENE
                                                                        770U
                                                                              BENZO-A-PYRENE
   77OUR 2-CHLORONAPHTHALENE
                                                                        770U INDENO (1,2,3-CD) PYRENE
   3700U 2-NITROANILINE
                                                                        770U DIBENZO(A.H)ANTHRACENE
                                                                        770U BENZO(GHI)PERYLENE
    770U DIMETHYL PHTHALATE
770U ACENAPHTHYLENE
                                                                              PERCENT MOISTURE
    770U 2.6-DINITROTOLUENE
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REMARKS

REMARKS

F001N01E5 *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT. *R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

01/04/91

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PESTICIDES/PCB'S DATA REPORT
PROJECT NO. 91-025 SAMPLE NO. 51666 SAMPLE TYPE: SOIL
                                                        PROG ELEM: NSF COLLECTED BY: M GORDON
                                                                                                        * *
    SOURCE: AMAX PHOSPHATE FACIL
                                                                              ST: FL
                                                        CITY: PALMETTO
..
                                                                                                        ..
                                                        COLLECTION START: 10/18/90 0900 STOP: 00/00/00
    STATION ID: SS-05
..
                                                                                                        .
                          SAS NUMBER:
                                                         D. NUMBER: Y170
    CASE NUMBER: 15099
**
                                                                                                        **
..
                                                                                                        * *
   ANALYTICAL RESULTS
   UG/KG
                   ANALYTICAL RESULTS
                                                        UG/KG
    19U ALPHA-BHC
                                                        190U METHOXYCHLOR
    19U BETA-BHC
                                                         370
                                                             ENDRIN KETONE
    19U DELTA-BHC
                                                             CHLORDANE (TECH. MIXTURE) /1
    19U GAMMA-BHC (LINDANE)
                                                        1900
                                                             GAMMA-CHLORDANE
                                                             ALPHA-CHLORDANE
    20U HEPTACHLOR
                                                        1900
       ALDRIN
                                                        370U
                                                             TOXAPHENE
    19U
    19U HEPTACHLOR EPOXIDE
                                                        1900
                                                             PCB-1016 (AROCLOR 1016)
    19U ENDOSULFAN I (ALPHA)
                                                        1900
                                                             PCB-1221 (AROCLOR 1221)
                                                             PCB-1232 (AROCLOR 1232)
    37U DIELDRIN
                                                        1900
    37U 4.4'-DDE (P.P'-DDE)
                                                        190U
                                                             PCB-1242 (AROCLOR 1242)
    37U ENDRIN
                                                             PCB-1248 (AROCLOR 1248)
                                                        190U
   37U ENDOSULFAN II (BETA)
37U 4,4' DDD (P,P' DDD)
                                                        3700
                                                             PCB-1254 (AROCLOR 1254)
                                                        370U PCB 1260 (AROCLOR 1260)
    37U ENDOSULFAN SULFATE
                                                             PERCENT MOISTURE
    37U 4.4'-DDT (P.P'-DDT)
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REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.
*C-CONFIRMED BY GCMS 1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

01/04/91

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MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT

SAMPLE NO. 51666 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON PROJECT NO. 91-025 ..

CITY: PALMETTO ST: FL

SOURCE: AMAX PHOSPHATE FACIL STATION ID: SS-05 COLLECTION START: 10/18/90 0900 STOP: 00/00/00 CASE . NO .: 15099 SAS NO.: D. NO.: Y170 MD NO: Y170 **

. . . .

ANALYTICAL RESULTS UG/KG

5000JF 4 UNIDENTIFIED COMPOUNDS N > PETROLEUM PRODUCT

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

01/04/91

PURGEABLE ORGANICS DATA REPORT	14 E30, ATTENS, GA. 01/04/91
PROJECT NO. 91-025 SAMPLE NO. 51668 SAMPLE TYPE: SOIL SOURCE: AMAX PHOSPHATE FACIL STATION ID: SS-06	PROG ELEM: NSF COLLECTED BY: M GORDON ** CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1205 STOP: 00/00/00 **
** CASE NO.: 15099 SAS NO.: UG/KG ANALYTICAL RESULTS	D. NO.: Y152 *** UG/KG ANALYTICAL RESULTS
13U CHLOROMETHANE 13U BROMOMETHANE 13U VINYL CHLORIDE 13U CHLOROETHANE 6U METHYLENE CHLORIDE 13U ACETONE 6U CARBON DISULFIDE 6U 1.1-DICHLOROETHENE(1.1-DICHLOROETHYLENE) 6U 1.2-DICHLOROETHANE 6U 1.2-DICHLOROETHANE 6U 1.2-DICHLOROETHANE 13U METHYL ETHYL KETONE 6U 1.1-TRICHLOROETHANE 6U CARBON TETRACHLORIDE 13U VINYL ACETATE 6U BROMODICHLOROMETHANE	6U 1,2-DICHLOROPROPANE 6U CIS-1,3-DICHLOROPROPENE 6U TRICHLOROETHENE(TRICHLOROETHYLENE) 6U DIBROMOCHLOROMETHANE 6U 1,1,2-TRICHLOROETHANE 6U BENZENE 6U TRANS-1,3-DICHLOROPROPENE 6U BROMOFORM 13U METHYL ISOBUTYL KETONE 13U METHYL ISOBUTYL KETONE 6U TETRACHLOROETHENE(TETRACHLOROETHYLENE) 6U 1,1,2,2-TETRACHLOROETHANE 1J TÓLUENE 6U CHLOROBENZENE 6U CHLOROBENZENE 6U STYRENE 6U TOTAL XYLENES 21 PERCENT MOISTURE

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

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EXTRACTABLE ORGANICS DATA REPORT
PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL
     PROJECT NO. 91-025 SAMPLE NO. 51668 SAMPLE TYPE: SOIL
     SOURCE: AMAX PHOSPHATE FACIL
     STATION ID: SS-06
                                                                            COLLECTION START: 10/17/90 1205 STOP: 00/00/00
. .
..
                                                   SAS NO.:
    CASE NO.: 15099
                                                                             D. NO.: Y152
ANALYTICAL RESULTS
                                                                           UG/KG
                                                                                                 ANALYTICAL RESULTS
                                                                          4000UR 3-NITROANILINE
    820U PHENOL
    8200 BIS(2-CHLOROETHYL) ETHER
8200 2-CHLOROPHENOL
                                                                            820U ACENAPHTHENE
                                                                           4000U 2,4-DINITROPHENOL
                                                                           4000U 2,4-DINITROPHENDL
4000U 4-NITROPHENDL
820U DIBENZOFURAN
820U 2,4-DINITROTOLUENE
820U DIETHYL PHTHALATE
820U 4-CHLOROPHENYL PHENYL ETHER
820U FLUORENE
    820U 1,3-DICHLOROBENZENE
    820U 1.4-DICHLOROBENZENE
  820U BENZYL ALCOHOL
820U 1,2-DICHLOROBENZENE
820U 2-METHYLPHENOL
820UR BIS(2-CHLOROISOPROP)
          BIS(2-CHLOROISOPROPYL) ETHER
    820U (3-AND/OR 4-)METHYLPHENOL
820U N-NITROSODI-N-PROPYLAMINE
                                                                           4000U 4-NITROANILINE
                                                                           4000U 2-METHYL-4.6-DINITROPHENOL
820U N-NITROSODIPHENYLAMINE/DIPHENYLAMINE
    8200 HEXACHLOROETHANE
   820UR NITROBENZENE
                                                                            820U 4-BROMOPHENYL PHENYL ETHER
    820U ISOPHORONE
                                                                            820U HEXACHLOROBENZENE (HCB)
   820U 2-NITROPHENOL
820U 2,4-DIMETHYLPHENOL
4000U BENZOIC ACID
                                                                           4000U PENTACHLOROPHENOL
                                                                            820U PHENANTHRENE
                                                                            820U
820U
                                                                                  ANTHRACENE
                                                                                  DI-N-BUTYLPHTHALATE
    820U
          BIS(2-CHLOROETHOXY) METHANE
    820U
          2,4-DICHLOROPHENOL
                                                                            820Ŭ
                                                                                  FLUORANTHENE
   820UR 1.2.4-TRICHLOROBENZENE
                                                                            820U PYRENE
    8200 NAPHTHALENE
                                                                            8200 BENZYL BUTYL PHTHALATE
    820U
          4-CHLOROANILINE
                                                                           1600U 3,3'-DICHLOROBENZIDINE
    820U HEXACHLOROBUTADIENE
                                                                            820U BENZO(A)ANTHRACENE
    820U 4-CHLORO-3-METHYLPHENOL
                                                                            820U CHRYSENE
                                                                            820U BIS(2-ETHYLHEXYL) PHTHALATE
820U DI-N-OCTYLPHTHALATE
820U BENZO(B AND/OR K)FLUORANTHENE
820U BENZO-A-PYRENE
   820U 2-METHYLNAPHTHALENE
820U HEXACHLOROCYCLOPENTADIENE (HCCP)
820U 2.4.6-TRICHLOROPHENOL
   4000U 2.4.5-TRICHLOROPHENOL
   820UR
          2-CHLORONAPHTHALENE
                                                                                  INDENO (1,2,3-CD) PYRENE
                                                                            820U
   4000U 2-NITROANILINE
                                                                            820U DIBENZO(A, H) ANTHRACENE
    820U DIMETHYL PHTHALATE
                                                                                  BENZO(GHI)PERYLENE
                                                                            820U
    820U ACENAPHTHYLENE
                                                                                  PERCENT MOISTURE
                                                                              20
    820U 2.6-DINITROTOLUENE
```

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

01/04/91 PESTICIDES/PCB'S DATA REPORT PROG ELEM: NSF COLLECTED BY: M GORDON PROJECT NO. 91-025 SAMPLE NO. 51668 SAMPLE TYPE: SOIL SOURCE: AMAX PHOSPHATE FACIL STATION ID: SS-06 CASE NUMBER: 15099 CITY: PALMETTO ST: FL . . . COLLECTION START: 10/17/90 1205 STOP: 00/00/00 SAS NUMBER: D. NUMBER: Y152 .. * * . . • • ANALYTICAL RESULTS UG/KG UG/KG ANALYTICAL RESULTS 20U ALPHA-BHC 200U METHOXYCHLOR 200 BETA-BHC 40U ENDRIN KETONE CHLORDANE (TECH. MIXTURE) /1
GAMMA-CHLORDANE /2 20U DELTA-BHC 200 GAMMA-BHC (LINDANE) 200 HEPTACHLOR 200U /2 2000 ALPHA-CHLORDANE 200 ALDRIN 400Ŭ TOXAPHENE 200 HEPTACHLOR EPOXIDE 200U PCB-1016 (AROCLOR 1016) 200 ENDOSULFAN I (ALPHA) 200Ú PCB-1221 (AROCLOR 1221) PCB-1221 (AROCLOR 1221) PCB-1232 (AROCLOR 1232) PCB-1242 (AROCLOR 1242) PCB-1248 (AROCLOR 1248) PCB-1254 (AROCLOR 1254) PCB-1260 (AROCLOR 1260) 400 DIELDRIN 200U 40U 4.4'-DDE (P.P'-DDE) 200U

2000

400U 400U

20

PERCENT MOISTURE

RFMARKS

400 ENDRIN

40U ENDOSULFAN II (BETA) 40U 4.4' DDD (P.P' DDD)

400 ENDOSULFAN SULFATE

40U 4.4'-DDT (P.P'-DDT)

RFMARKS

FOOTNOTES *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT. *R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS. *C-CONFIRMED BY GCMS

01/04/91

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MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT

PROJECT NO. 91-025 SAMPLE NO. 51668 SAMPLE TYPE: SOIL .

SOURCE: AMAX PHOSPHATE FACIL STATION ID: SS-06

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CASE NO .: 15099 SAS NO.: PROG ELEM: NSF CITY: PALMETTO

COLLECTED BY: M GORDON ST: FL

COLLECTION START: 10/17/90 1205 STOP: 00/00/00 D. NO.: Y152 MD NO: Y152

ANALYTICAL RESULTS UG/KG

2000Ji 2 UNIDENTIFIED COMPOUNDS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN

*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

01/04/91

PURGEABLE ORGANICS DATA REPORT	EVA REGION IV ESD, AVIENS, UK.	01/04/31
PROJECT NO. 91-025 SAMPLE NO. 51667 SAMPLE SOURCE: AMAX PHOSPHATE FACIL STATION ID: SS-07	LE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1150 STOP: 00/00/	/00
	S NO.: D. NO.: Y153 UG/KG ANALYTICAL RESULTS	
12U CHLOROMETHANE 12U BROMOMETHANE 12U VINYL CHLORIDE 12U CHLOROETHANE 6U METHYLENE CHLORIDE 12U ACETONE 6U CARBON DISULFIDE 6U 1.1-DICHLOROETHENE(1.1-DICHLOROETHYLENE) 6U 1.1-DICHLOROETHANE 6U 1.2-DICHLOROETHENE (TOTAL) 6U CHLOROFORM 6U 1.2-DICHLOROETHANE 12U METHYL ETHYL KETONE 6U 1.1-TRICHLOROETHANE 6U CARBON TETRACHLORIDE 12U VINYL ACETATE 6U BROMODICHLOROMETHANE	6U 1,2-DICHLOROPROPANE 6U CIS-1,3-DICHLOROPROPENE 6U TRICHLOROETHENE (TRICHLOROETHYLENE) 6U DIBROMOCHLOROMETHANE 6U 1,1,2-TRICHLOROETHANE 6U BENZENE 6U TRANS-1,3-DICHLOROPROPENE 6U BROMOFORM 12U METHYL ISOBUTYL KETONE 12U METHYL BUTYL KETONE 6U TETRACHLOROETHENE (TETRACHLOROETHYLENE) 6U 1,1,2,2-TETRACHLOROETHANE 6U CHLOROBENZENE 6U CHLOROBENZENE 6U ETHYL BENZENE 6U STYRENE 6U TOTAL XYLENES 17 PERCENT MOISTURE	

REMARKS

REMARKS

FOOTNOTES

*A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN

*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

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01/04/91

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EXTRACTABLE ORGANICS DATA REPORT
PROJECT NO. 91-025 SAMPLE NO. 51667 SAMPLE TYPE: SOIL SOURCE: AMAX PHOSPHATE FACIL
                                                                       PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1150 STOP: 00/00/00
..
                                                                                                                                     ..
    STATION ID: SS-07
..
                                                                                                                                     ..
**
                                                                                                                                     * *
   CASE NO.: 15099
                                                SAS NO.:
                                                                        D. NO.: Y153
                                                                                                                                     .
ANALYTICAL RESULTS
                                                                       UG/KG
   UG/KG
                                                                                           ANALYTICAL RESULTS
                                                                      3900UR 3-NITROANILINE
    480J PHENOL
                                                                      800U ACENAPHTHENE
3900U 2,4-DINITROPHENOL
3900U 4-NITROPHENOL
   800U BIS(2-CHLOROETHYL) ETHER
    800U 2-CHLOROPHENOL
    800U 1,3-DICHLOROBENZENE
    800U 1,4-DICHLOROBENZENE
                                                                        800U DIBENZOFURAN
    800U BENZYL ALCOHOL
                                                                        800U 2,4-DINITROTOLUENE
                                                                       800U DIETHYL PHTHALATE
800U 4-CHLOROPHENYL PHENYL ETHER
    800U 1,2-DICHLOROBENZENE
    8000 2-METHYLPHENOL
   BOOUR BIS(2-CHLOROISOPROPYL) ETHER
                                                                        800U FLUORENE
    800U (3-AND/OR 4-)METHYLPHENOL
                                                                       3900U 4-NITROANILINE
                                                                        9000 2-METHYL-4-6-DINITROPHENOL
8000 N-NITROSODIPHENYLAMINE/DIPHENYLAMINE
    800U N-NITROSODI-N-PROPYLAMINE
                                                                       3900U
    800U HEXACHLOROETHANE
                                                                             4. BROMOPHENYL PHENYL ETHER HEXACHLOROBENZENE (HCB)
                                                                        800U
   800UR NITROBENZENE
                                                                        800U
   800U ISOPHORONE
   800U
         2-NITROPHENOL
                                                                       3900U
                                                                              PENTACHLOROPHENOL
   800U 2.4-DIMETHYLF
3900U BENZOIC ACID
         2,4-DIMETHYLPHENOL
                                                                        800U
                                                                              PHENANTHRENE
                                                                              ANTHRACENE
                                                                        8000
   800U BIS(2-CHLOROETHOXY) METHANE
                                                                        8000
                                                                              DI-N-BUTYLPHTHALATE
   800U 2.4-DICHLOROPHENOL
                                                                             FLUORANTHENE
                                                                        800U
   800UR 1.2.4-TRICHLOROBENZENE
                                                                              PYRENE
                                                                        800U
   800U NAPHTHALENE
                                                                        800U
                                                                              BENZYL BUTYL PHTHALATE
   800U 4-CHLOROANILINE
800U HEXACHLOROBUTADIENE
                                                                              3,3'-DICHLOROBENZIDINE
                                                                       1600U
                                                                              BÉNZO(A)ANTHRACENE
                                                                        8000
   800U 4-CHLORO-3-METHYLPHENOL
                                                                        800U
                                                                              CHRYSENE
   800U 2-METHYLNAPHTHALENE
                                                                        8000
                                                                              BIS(2-ETHYLHEXYL) PHTHALATE
  800U HEXACHLOROCYCLOPENTADIENE (HCCP)
800U 2.4.6~TRICHLOROPHENOL
3900U 2.4.5~TRICHLOROPHENOL
                                                                        800U DI-N-OCTYLPHTHALATE
                                                                        800U BENZO(B AND/OR K)FLUORANTHENE
                                                                        800U BENZO-A-PYRENE
  800UR 2-CHLOROMAPHTHALENE
3900U 2-NITROANILINE
800U DIMETHYL PHTHALATE
800U ACENAPHTHYLENE
                                                                        800U INDENO (1.2.3-CD) PYRENE
                                                                        800U DIBENZO(A, H) ANTHRACENE
                                                                       800U
                                                                              BENZO(GHI)PERYLENE
                                                                              PERCENT MOISTURE
   800U 2,6-DINITROTOLUENE
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REMARKS

FOOTNOTES *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
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RFMARKS

01/04/91

PESTICIDES/PCB'S DATA REPORT	EIN REGION IV ESD, AT	HEND, CA.	01/04/91
PROJECT NO. 91-025 SAMPLE NO. 51667 SAMPLE SOURCE: AMAX PHOSPHATE FACIL STATION ID: SS-07 CASE NUMBER: 15099 SAS NUMBER:	TYPE: SOIL PRO CIT COL	G ELEM: NSF COLLECTED BY: M GORDON Y: PALMETTO ST: FL LECTION START: 10/17/90 1150 STOP: NUMBER: Y153	**
UG/KG ANALYTICAL RESULTS	UG/	KG ANALYTICAL RESULTS	
19U ALPHA-BHC 19U BETA-BHC 19U DELTA-BHC 19U GAMMA-BHC (LINDANE) 19U HEPTACHLOR 19U ALDRIN 19U HEPTACHLOR EPOXIDE 19U ENDOSULFAN I (ALPHA) 39U DIELDRIN 39U 4,4'-DDE (P.P'-DDE) 39U ENDOSULFAN II (BETA) 39U ENDOSULFAN II (BETA) 39U 4,4'-DDD (P.P' DDD) 39U ENDOSULFAN SULFATE 39U 4,4'-DDT (P.P'-DDT)	190 39 190 190 390 190 190 190 190 390 390	U METHOXYCHLOR U ENDRIN KETONE CHLORDANE (TECH. MIXTURE) /1 U GAMMA-CHLORDANE /2 U ALPHA-CHLORDANE /2 U TOXAPHENE U PCB-1016 (AROCLOR 1016) U PCB-1221 (AROCLOR 1221) U PCB-1232 (AROCLOR 1232) U PCB-1242 (AROCLOR 1242) U PCB-1248 (AROCLOR 1248) U PCB-1254 (AROCLOR 1254) U PCB-1250 (AROCLOR 1254) U PCB-1260 (AROCLOR 1260)	

REMARKS

REMARKS

FOOTNOTES

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*C-CONFIRMED BY GCMS

1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

01/04/91

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MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT

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PROJECT NO. 91-025 SAMPLE NO. 51667 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON ST: FL

CITY: PALMETTO SOURCE: AMAX PHOSPHATE FACIL * *

COLLECTION START: 10/17/90 1150 STOP: 00/00/00 D. NO.: Y153 MD NO: Y153 STATION ID: SS-07 CASE NO .: 15099 SAS NO.:

** **

ANALYTICAL RESULTS UG/KG

1000J* 1 UNIDENTIFIED COMPOUND 2000JN DODECANOIC ACID 4000JN HEXADECANOIC ACID

^{***}FOOTNOTES*** *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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01/04/91 PURGEABLE ORGANICS DATA REPORT PROG ELEM: NSF COLLECTED BY: M GORDON PROJECT NO. 91-025 SAMPLE NO. 51681 SAMPLE TYPE: SOIL .. SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO ST: FL STATION ID: SB-01 COLLECTION START: 10/16/90 1535 STOP: 00/00/00 * * * * .. ** SAS NO.: CASE NO.: 15099 D. NO.: Y139 UG/KG ANALYTICAL RESULTS UG/KG ANALYTICAL RESULTS 6U 1,2-DICHLOROPROPANE 12U CHLOROMETHANE 12U BROMOMETHANE 6U CIS-1, 3-DICHLOROPROPENE 12U VINYL CHLORIDE TRICHLOROETHENE (TRICHLOROETHYLENE) **CHLOROE THANE** DIBROMOCHLOROMETHANE 120 6U METHYLENE CHLORIDE 6U 1.1.2-TRICHLOROETHANE 7Ü 120 ACETONE 6U BENZENE CARBON DISULFIDE 6U TRANS-1.3-DICHLOROPROPENE 6U 1.1-DICHLOROETHENE(1.1-DICHLOROETHYLENE) 6U BROMOFORM 6U 1,1-DICHLOROETHANE 120 METHYL ISOBUTYL KETONE 6U 1,2-DICHLOROETHENE (TOTAL) 120 METHYL BUTYL KETONE 6U CHLOROFORM TETRACHLOROETHENE (TETRACHLOROETHYLENE) 60 6U 1.2-DICHLOROETHANE 6U 1,1,2,2-TETRACHLOROETHANE MÉTHYL ETHYL KETONE TOLUENE 6U 120 1,1,1-TRICHLOROETHANE CHLOROBENZENE **6**U CARBON TETRACHLORIDE ETHYL BENZENE 6U 6U VINYL ACETATE STYRENE 120 6U **BROMODICHLOROMETHANE** TOTAL XYLENES

REMARKS

REMARKS

PERCENT MOISTURE

F001N01E5

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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EXTRACTABLE ORGANICS DATA REPORT
PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL
     PROJECT NO. 91-025 SAMPLE NO. 51681 SAMPLE TYPE: SOIL
                                                                                             ST: FL
     SOURCE: AMAX PHOSPHATE FACIL
     STATION ID: SB-01
                                                                         COLLECTION START: 10/16/90 1535 STOP: 00/00/00
..
                                                                                                                                       ..
                                                                                                                                       * *
..
    CASE NO .: 15099
                                                SAS NO.:
                                                                         D. NO.: Y139
                                                                                                                                       ..
ANALYTICAL RESULTS
                                                                        UG/KG
                                                                                             ANALYTICAL RESULTS
    800U PHENOL
                                                                       3900UR 3-NITROANILINE
    800U BIS(2-CHLOROETHYL) ETHER
800U 2-CHLOROPHENOL
                                                                        800U ACENAPHTHENE
                                                                        3900U 2,4-DINITROPHENOL
    800U 1.3-DICHLOROBENZENE
                                                                        3900U 4-NITROPHENOL
                                                                         800U DIBENZOFURAN
800U 2.4-DINITROTOLUENE
800U DIETHYL PHTHALATE
    800U 1.4-DICHLOROBENZENE
  800U BENZYL ALCOHOL
800U 1,2-DICHLOROBENZENE
800U 2-METHYLPHENOL
800UR BIS(2-CHLOROISOPROPYL) ETHER
                                                                         800U 4-CHLOROPHENYL PHENYL ETHER
                                                                         800U FLUORENE
    800U (3-AND/OR 4-)METHYLPHENOL
                                                                        3900U 4-NITROANILINE
    800U N-NITROSODI-N-PROPYLAMINE
800U HEXACHLOROETHANE
                                                                        3900U 2-METHYL-4.6-DINITROPHENOL
800U N-NITROSODIPHENYLAMINE/DIPHENYLAMINE
   SOOUR NITROBENZENE
                                                                         800U 4 BROMOPHENYL PHENYL ETHER
    800U ISOPHORONE
                                                                         800U HEXACHLOROBENZENE (HCB)
  800U 2-NITROPHENOL
800U 2.4-DIMETHYLPHENOL
3900U BENZOIC ACID
                                                                        3900U PENTACHLOROPHENOL
800U PHENANTHRENE
                                                                         800U ANTHRACENE
    800U
          BIS(2-CHLOROETHOXY) METHANE
                                                                         800U DI-N-BUTYLPHTHALATE
    800U 2,4-DICHLOROPHENOL
                                                                         800U FLUORANTHENE
   800UR 1.2.4-TRICHLOROBENZENE
                                                                         800U PYRENE
    800U NAPHTHALENE
                                                                         800U BENZYL BUTYL PHTHALATE
    800U 4-CHLOROANILINE
                                                                        1600U 3.3'-DICHLOROBENZIDINE
    800U HEXACHLOROBUTADIENE
                                                                         800U BÉNZO(A)ANTHRACENE
   800U 4-CHLORO-3-METHYLPHENOL
800U 2-METHYLNAPHTHALENE
800U HEXACHLOROCYCLOPENTADIENE (HCCP)
                                                                         800U CHRYSENE
800U BIS(2-ETHYLHEXYL)_PHTHALATE
                                                                         800U DI-N-OCTYLPHTHALATE
   800U 2.4.6-TRICHLOROPHENOL
3900U 2.4.5-TRICHLOROPHENOL
                                                                         800U BENZO(B AND/OR K)FLUORANTHENE
                                                                         800U BENZO-A-PYRENE
  800UR 2-CHLORONAPHTHALENE
3900U 2-NITROANILINE
                                                                         800U INDENO (1.2.3-CD) PYRENE
800U DIBENZO(A.H)ANTHRACENE
    800U DIMETHYL PHTHALATE
                                                                         800U BENZO(GHI)PERYLENE
    800U ACENAPHTHYLENE
                                                                           18 PERCENT MOISTURE
    800U 2.6-DINITROTOLUENE
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REMARKS ***REMARKS***

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

01/04/91

PESTICIDES/PCB'S DATA REPORT	ETA REGION IV ESD, AIRENS, GA.	01/04/91
PROJECT NO. 91-025 SAMPLE NO. 51681 SAMPLE SOURCE: AMAX PHOSPHATE FACIL STATION ID: SB-01 CASE NUMBER: 15099 SAS NUMBER:		14
UG/KG ANALYTICAL RESULTS	* * * * * * * * * * * * * * * * * * *	
20U ALPHA-BHC 20U BETA-BHC 20U DELTA-BHC 20U GAMMA-BHC (LINDANE) 20U HEPTACHLOR 20U ALDRIN 20U HEPTACHLOR EPOXIDE 20U ENDOSULFAN I (ALPHA) 39U DIELDRIN 39U 4.4'-DDE (P.P'-DDE) 39U ENDOSULFAN II (BETA) 39U 4.4' DDD (P.P' DDD) 39U ENDOSULFAN SULFATE 39U 4.4'-DDT (P.P'-DDT)	200U METHOXYCHLOR 39U ENDRIN KETONE CHLORDANE (TECH. MIXTURE) /1 200U GAMMA-CHLORDANE /2 200U ALPHA-CHLORDANE /2 390U TOXAPHENE 200U PCB-1016 (AROCLOR 1016) 200U PCB-1221 (AROCLOR 1221) 200U PCB-1232 (AROCLOR 1232) 200U PCB-1242 (AROCLOR 1242) 200U PCB-1248 (AROCLOR 1248) 390U PCB-1254 (AROCLOR 1254) 390U PCB-1250 (AROCLOR 1254) 390U PCB-1260 (AROCLOR 1260) 18 PERCENT MOISTURE	

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT. *R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION. *C-CONFIRMED BY GCMS 1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

01/04/91

PURGEABLE ORGANICS DATA REPORT		0.,0.,0.
PROJECT NO. 91-025 SAMPLE NO. 51686 SAMPLE SOURCE: AMAX PHOSPHATE FACILES STATION ID: SB-02	PROG ELEM: NSF COLLECTED BY: M GOR CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 0945 S	**
** CASE NO.: 15099 SAS	5 NO.: D. NO.: Y145 UG/KG ANALYTICAL RESULT	**
12U CHLOROMETHANE 12U BROMOMETHANE 12U VINYL CHLORIDE 12U CHLOROETHANE 6U METHYLENE CHLORIDE 12U ACETONE 6U CARBON DISULFIDE 6U 1,1-DICHLOROETHENE(1,1-DICHLOROETHYLENE) 6U 1,2-DICHLOROETHANE 6U 1,2-DICHLOROETHENE (TOTAL) 6U CHLOROFORM 6U 1,2-DICHLOROETHANE 12U METHYL ETHYL KETONE 6U 1,1-TRICHLOROETHANE 6U CARBON TETRACHLORIDE 12U VINYL ACETATE 6U BROMODICHLOROMETHANE	6U 1,2-DICHLOROPROPANE 6U CIS-1,3-DICHLOROPROPENE 6U TRICHLOROETHENE (TRICHLOROETHYL 6U DIBROMOCHLOROMETHANE 6U 1,1,2-TRICHLOROETHANE 6U BÉNZENE 6U TRANS-1,3-DICHLOROPROPENE 6U BROMOFORM 12U METHYL ISOBUTYL KETONE 12U METHYL BUTYL KETONE 6U TETRACHLOROETHENE (TETRACHLOROE 6U 1,1,2,2-TETRACHLOROETHANE 6U CHLOROBENZENE 6U CHLOROBENZENE 6U ETHYL BENZENE 6U STYRENE 6U TOTAL XYLENES 16 PERCENT MOISTURE	

REMARKS

REMARKS

FOOTNOTES

*A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

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EXTRACTABLE ORGANICS DATA REPORT
** PROJECT NO. 91-025 SAMPLE NO. 51686 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: 1M GORDON **

** SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO ST: FL **
                                                                        PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL
                                                                        COLLECTION START: 10/17/90 0945 STOP: 00/00/00
     STATION ID: SB-02
                                                                         D. NO.: Y145
                                                SAS NO.:
** CASE NO.: 15099
UG/KG
    UG/KG
                      ANALYTICAL RESULTS
                                                                                            ANALYTICAL RESULTS
    790U PHENOL
                                                                      3800UR 3-NITROANILINE
    790U BIS(2-CHLOROETHYL) ETHER
790U 2-CHLOROPHENOL
                                                                        790U ACENAPHTHENE
                                                                        3800U 2.4-DINITROPHENOL
    790U 1,3-DICHLOROBENZENE
                                                                        3800U 4-NITROPHENOL
                                                                        790U DIBENZOFURAN
    790U 1.4-DICHLOROBENZENE
                                                                        790U 2.4-DINITROTOLUENE
790U DIETHYL PHTHALATE
790U 4-CHLOROPHENYL PHENYL ETHER
    790U BENZYL ALCOHOL
    790U 1,2-DICHLOROBENZENE
    790U
          2-METHYLPHENOL
   790UR BIS(2-CHLOROISOPROPYL) ETHER
                                                                        790U FLUORENE
         (3-AND/OR 4-)METHYLPHENOL
N-NITROSODI-N-PROPYLAMINE
                                                                       3800U 4-NITROANILINE
    790U
                                                                       3800U 2-METHYL-4.6-DINITROPHENOL
790U N-NITROSODIPHENYLAMINE/DIPHENYLAMINE
    790Ŭ
    790U
         HEXACHLOROETHANE
                                                                        790U 4 BROMOPHENYL PHENYL ETHER
   790UR NITROBENZENE
          ISOPHORONE
                                                                        790U HEXACHLOROBENZENE (HCB)
    790U
         2-NITROPHENOL
                                                                       3800U PENTACHLOROPHENOL
    790U
    790U
          2,4-DIMETHYLPHENOL
                                                                        790U PHENANTHRENE
                                                                        790U ANTHRACENE
   38000
          BÉNZOIC ACID
          BIS(2-CHLOROETHOXY) METHANE
                                                                        790U
                                                                              DI-N-BUTYLPHTHALATE
    790U
                                                                        790U
790U
    790Ŭ
          2.4-DICHLOROPHENOL
                                                                              FLUORANTHENE
   790UR
          1,2,4-TRICHLOROBENZENE
                                                                              PYRENE
    790U
          NAPHTHALENE
                                                                        790U BENZYL BUTYL PHTHALATE
    790U
          4-CHLOROANILINE
                                                                        16000
                                                                              3.3'-DICHLOROBENZIDINE
    790U HEXACHLOROBUTADIENE
                                                                              BÉNZO(A)ANTHRACENE
                                                                        790U
                                                                        790U CHRYSÈNÉ
    790U 4-CHLORO-3-METHYLPHENOL
                                                                        790U BIS(2-ETHYLHEXYL) PHTHALATE
790U DI-N-OCTYLPHTHALATE
790U BENZO(B AND/OR K)FLUGRANTHENE
    790U 2-METHYLNAPHTHALENE
    7900 HEXACHLOROCYCLOPENTADIENE (HCCP)
          2.4.6-TRICHLOROPHENOL
    790U
          2.4.5-TRICHLOROPHENOL
                                                                              BENZO-A-PYRENE
   3800U
                                                                        790U
                                                                        790U
                                                                              INDENO (1,2,3-CD) PYRENE
   790UR
          2-CHLORONAPHTHALENE
                                                                        790U DIBENZO(A,H)ANTHRACENE
   38000
          2-NITROANILINE
                                                                        790U BENZO(GHI)PERYLENE
    790U DIMETHYL PHTHALATE
    790U ACENAPHTHYLENE
                                                                          16 PERCENT MOISTURE
   790U 2,6-DINITROTOLUENE
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REMARKS

REMARKS

^{*}Ă-ĂVĒRĀĞE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L'ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

01/04/91

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PESTICIDES/PCB'S DATA REPORT
   . . . . . .
    PROJECT NO. 91-025
                    SAMPLE NO. 51686 SAMPLE TYPE: SOIL
                                                          PROG ELEM: NSF COLLECTED BY: M GORDON
**
                                                                                                            ..
                                                           CITY: PALMETTO
                                                                                  ST: FL
..
    SOURCE: AMAX PHOSPHATE FACIL
                                                                                                            * *
    STATION ID: SB-02
                                                           COLLECTION START: 10/17/90 0945 STOP: 00/00/00
                                                                                                            ..
                           SAS NUMBER:
                                                           D. NUMBER: Y145
    CASE NUMBER: 15099
**
                                                                                                            * *
* *
                                                                                                            * *
   UG/KG
                    ANALYTICAL RESULTS
                                                           UG/KG
                                                                           ANALYTICAL RESULTS
                                                           1900 METHOXYCHLOR
    19U ALPHA-BHC
    19U BETA-BHC
                                                           38U
                                                               ENDRIN KETONE
    19U DELTA-BHC
                                                                CHLORDANE (TECH. MIXTURE) /1
        GAMMA-BHC (LINDANE)
                                                           1900
                                                                GAMMA-CHLORDANE
    190
        HEPTACHLOR
                                                           1900
                                                                ALPHA-CHLORDANE
    190
                                                           3800
    190
        ALDRIN
                                                                TOXAPHENE
        HEPTACHLOR EPOXIDE
                                                               PCB-1016 (AROCLOR 1016)
    190
                                                           1900
    190
        ENDOSULFAN I (ALPHA)
                                                           190U
                                                               PCB-1221 (AROCLOR 1221)
        DIELDRIN
                                                           1900
                                                               PCB-1232 (AROCLOR 1232)
    38U 4.4'-DDE (P.P'-DDE)
                                                           1900
                                                               PCB-1242 (AROCLOR 1242)
    38U
       ENDRIN
                                                           1900
                                                               PCB-1248 (AROCLOR 1248)
    38U
        ENDOSULFAN II (BETA)
4,4' DDD (P,P'-DDD)
                                                           380U
                                                               PCB-1254 (AROCLOR 1254)
PCB-1260 (AROCLOR 1260)
    380
                                                           380U
        ENDOSULFAN SULFATE
                                                               PERCENT MOISTURE
    38U
    38U
        4.4'-DDT (P.P'-DDT)
```

REMARKS

REMARKS

^{*}NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *A-AVERAGE VALUE *NA-NOT ANALYZED

^{*}K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT. *R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

^{1.} WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS. *C-CONFIRMED BY GCMS

01/04/91

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* *

MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT

SAS NO.:

STATION ID: SB-02

CASE.NO .: 15099

..

..

PROJECT NO. 91-025 SAMPLE NO. 51686 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON SOURCE: AMAX PHOSPHATE FACIL ..

CITY: PALMETTO ST: FL

COLLECTION START: 10/17/90 0945 STOP: 00/00/00

MD NO: Y145 D. NO.: Y145

ANALYTICAL RESULTS UG/KG

800JE 1 UNIDENTIFIED COMPOUNDS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
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01/04/91

PURGEABLE ORGANICS DATA REPORT	LFA-REGION IV LSD, AIRENS, GA.	01/04/91
PROJECT NO. 91-025 SAMPLE NO. 51671 SAMPLE SOURCE: AMAX PHOSPHATE FACIL STATION ID: SB-03	CITY: PALMETTO ST: FL	00/00/00
** CASE NO.: 15099 SAS N UG/KG ANALYTICAL RESULTS	NO.: D. NO.: Y149 * * * * * * * * * * * * * * * * * * *	• • • • • • • • • • • • • • • • • • • •
12U CHLOROMETHANE 12U BROMOMETHANE 12U VINYL CHLORIDE 12U CHLOROETHANE 6U METHYLENE CHLORIDE 12U ACETONE 6U CARBON DISULFIDE 6U 1,1-DICHLOROETHENE(1,1-DICHLOROETHYLENE) 6U 1,2-DICHLOROETHANE 6U 1,2-DICHLOROETHANE 12-DICHLOROETHANE 12U METHYL ETHYL KETONE 6U 1,1-TRICHLOROETHANE 6U 1,1-TRICHLOROETHANE 6U 1,1-TRICHLOROETHANE 6U CARBON TETRACHLORIDE 12U VINYL ACETATE 6U BROMODICHLOROMETHANE	6U 1.2-DICHLOROPROPANE 6U CIS-1.3-DICHLOROPROPENE 6U TRICHLOROETHENE (TRICHLOROETHYLENE) 6U DIBROMOCHLOROMETHANE 6U 1.1.2-TRICHLOROETHANE 6U BENZENE 6U TRANS-1.3-DICHLOROPROPENE 6U BROMOFORM 12U METHYL ISOBUTYL KETONE 12U METHYL BUTYL KETONE 6U TETRACHLOROETHENE (TETRACHLOROETHYLE) 6U 1.1.2.2-TETRACHLOROETHANE 6U TOLUENE 6U CHLOROBENZENE 6U CHLOROBENZENE 6U TOTAL XYLENES 19 PERCENT MOISTURE	ENE)

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

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EXTRACTABLE ORGANICS DATA REPORT
PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1135 STOP: 00/00/00
    PROJECT NO. 91-025 SAMPLE NO. 51671 SAMPLE TYPE: SOIL
    SOURCE: AMAX PHOSPHATE FACIL
**
    STATION ID: SB-03
..
                                                                                                                            ..
                                                                                                                            * *
                                             SAS NO.:
** CASE NO.: 15099
                                                                    D. NO.: Y149
                                                                                                                             ..
   ANALYTICAL RESULTS
                                                                  UG/KG
                                                                                   ANALYTICAL RESULTS
   810U PHENOL
810U BIS(2-CHLOROETHYL) ETHER
810U 2-CHLOROPHENOL
                                                                 4000UR 3-NITROANILINE
810U ACENAPHTHENE
4000U 2,4-DINITROPHENOL
        1.3-DICHLOROBENZENE
                                                                  4000U 4-NITROPHENOL
   8100
   810U 1.4-DICHLOROBENZENE
                                                                   810U DIBENZOFURAN
   810U BÉNZYL ALCOHOL
                                                                   810U 2.4-DINITROTOLUENE
   810U 1.2-DICHLOROBENZENE
                                                                   810U DIETHYL PHTHALATE
   8100 2-METHYLPHENOL
                                                                   810U 4-CHLOROPHENYL PHENYL ETHER
  BIOUR BIS(2-CHLOROISOPROPYL) ETHER
                                                                   810U FLUORENE
   810U (3-AND/OR 4-)METHYLPHENOL
810U N-NITROSODI-N-PROPYLAMINE
                                                                  4000U 4-NITROANILINE
                                                                  4000U 2-METHYL-4,6-DINITROPHENOL
810U N-NITROSODIPHENYLAMINE/DIPHENYLAMINE
   810U HEXACHLOROETHANE
  810UR NITROBENZENE
                                                                         4 BROMOPHENYL PHENYL ETHER
                                                                   810U
   810U ISOPHORONE
                                                                         HEXACHLOROBENZENE (HCB)
                                                                   810U
   810U 2-NITROPHENOL
                                                                         PENTACHLOROPHENOL
                                                                  4000U
   810U 2.4-DIMETHYLPHENOL
                                                                   810U PHENANTHRENE
   4000U BENZOIC ACID
                                                                         ANTHRACENE
                                                                   810U
   810U BIS(2-CHLOROETHOXY) METHANE
                                                                   810U DI-N-BUTYLPHTHALATE
   810U 2,4-DICHLOROPHENOL
B10UR 1.2,4-TRICHLOROBENZENE
810U NAPHTHALENE
                                                                   810U
                                                                        FLUORANTHENE
  810UR
                                                                   810U
                                                                         PYRENE
                                                                         BENZYL BUTYL PHTHALATE
3,3'-DICHLOROBENZIDINE
                                                                   810U
   810U 4-CHLOROANILINE
                                                                  1600U
   810U HEXACHLOROBUTADIENE
                                                                         BÉNZO(A)ANTHRACENE
                                                                   810U
   810U 4-CHLORO-3-METHYLPHENOL
                                                                         CHRYSÈNÉ
                                                                   810U
   810U 2-METHYLNAPHTHALENE
                                                                   8100
                                                                         BIS(2-ETHYLHEXYL) PHTHALATE
   810U HEXACHLOROCYCLOPENTADIENE (HCCP)
                                                                   810U
                                                                         DI-N-OCTYLPHTHALATE
   810U 2.4.6-TRICHLOROPHENOL
                                                                   810U BENZO(B AND/OR K)FLUORANTHENE
  4000U 2.4.5-TRICHLOROPHENOL
                                                                   8100
                                                                         BENZO-A-PYRENE
  810UR 2-CHLORONAPHTHALENE
                                                                         INDENO (1,2,3-CD) PYRENE
                                                                   8100
                                                                   810U DIBENZO(A, H)ANTHRACENE
  4000U 2-NITROANILINE
   810U DIMETHYL PHTHALATE
                                                                   810U BENZO(GHI)PERYLENE
   810U ACENAPHTHYLENE
                                                                     19 PERCENT MOISTURE
   810U 2.6-DINITROTOLUENE
```

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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01/04/91

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PESTICIDES/PCB'S DATA REPORT
PROG ELEM: NSF COLLECTED BY: M GORDON
    PROJECT NO. 91-025 SAMPLE NO. 51671 SAMPLE TYPE: SOIL
..
                                                                                                          ..
                                                                            ST: FL
    SOURCE: AMAX PHOSPHATE FACIL
                                                         CITY: PALMETTO
..
                                                                                                          * *
                                                         COLLECTION START: 10/17/90 1135 STOP: 00/00/00
    STATION ID: SB-03
..
                                                                                                          * *
    CASE NUMBER: 15099
                           SAS NUMBER:
                                                          D. NUMBER: Y149
**
                                                                                                          * *
                                                                                                          * *
  UG/KG
                   ANALYTICAL RESULTS
                                                         UG/KG
                                                                          ANALYTICAL RESULTS
    20U ALPHA-BHC
                                                          200U
                                                              METHOXYCHLOR
    20U BETA-BHC
                                                          40U
                                                              ENDRIN KETONE
    200 DELTA-BHC
                                                               CHLORDANE (TECH. MIXTURE) /1
       GAMMA-BHC (LINDANE)
                                                              GAMMA-CHLORDANE
                                                          200U
    20U
       HEPTACHLOR
                                                          200U
                                                              ALPHA-CHLORDANE
    20U
    20U
       ALDRIN
                                                          400U
                                                              TOXAPHENE
       HEPTACHLOR EPOXIDE
                                                              PCB-1016 (AROCLOR 1016)
    20U
                                                          200U
       ENDOSULFAN I (ALPHA)
                                                              PCB-1221 (AROCLOR 1221)
    20U
                                                          200U
                                                              PCB-1232 (AROCLOR 1232)
    40U DIELDRIN
                                                          200U
                                                              PCB-1242 (AROCLOR 1242)
PCB-1248 (AROCLOR 1248)
PCB-1254 (AROCLOR 1254)
    40U 4.4'-DDE (P.P'-DDE)
                                                          200U
    40U
       ENDRIN
                                                          2000
    40U
       ENDOSULFAN II (BETA)
                                                          400U
    40U 4,4' DDD (P.P' DDD)
                                                          400U
                                                              PCB 1260 (AROCLOR 1260)
    400 ENDOSULFAN SULFATE
                                                           19
                                                              PERCENT MOISTURE
    40U 4.4'-DDT (P.P'-DDT)
```

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN

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*C-CONFIRMED BY GCMS

1. WHEN NO VALUE IS REPORTED. SEE CHLORDANE CONSTITUENTS.

01/04/91

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MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT

PROJECT NO. 91-025 SAMPLE NO. 51671 SAMPLE TYPE: SOIL

SOURCE: AMAX PHOSPHATE FACIL

PROG ELEM: NSF COLLECTED BY: M GORDON

CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1135 STOP: 00/00/00 MD NO: Y149

STATION ID: SB-03 CASE.NO.: 15099 SAS NO.:

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**

..

D. NO.: Y149

ANALYTICAL RESULTS UG/KG

2 UNIDENTIFIED COMPOUNDS 2000少

^{*}NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *A-AVERAGE VALUE *NA-NOT ANALYZED

^{*}K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM

EPA-REGION IV ESD. ATHENS. GA. 01/04/91 PURGEABLE ORGANICS DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51661 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO ST: FL COLLECTION START: 10/18/90 1030 STOP: 00/00/00 STATION ID: SB-04 ** CASE NO .: 15099 SAS NO.: D. NO.: Y174 UG/KG ANALYTICAL RESULTS UG/KG ANALYTICAL RESULTS 12U CHLOROMETHANE 6U 1.2-DICHLOROPROPANE 6U CIS-1.3-DICHLOROPROPENE **BROMOME THANE** 120 VINYL CHLORIDE 6U TRICHLOROETHENE (TRICHLOROETHYLENE) 120 12U CHLOROETHANE **6U DIBROMOCHLOROMETHANE** 6U METHYLENE CHLORIDE 6U 1.1.2-TRICHLOROETHANE **6U BENZENE** 12U ACETONE 6U CARBON DISULFIDE 6U TRANS-1, 3-DICHLOROPROPENE 1.1-DICHLOROETHENE(1,1-DICHLOROETHYLENE) BROMOFORM 6U 6U METHYL ISOBUTYL KETONE
METHYL BUTYL KETONE
TETRACHLOROETHENE(TETRACHLOROETHYLENE) 6U 1.1-DICHLOROETHANE 12U 60 1.2-DICHLOROETHENE (TOTAL) 12U 6U 1.2-DICHLOROETHANE 1,1,2,2-TETRACHLOROETHANE 6U 6U 12U MÉTHYL ETHYL KETONE TÓLÚENE 6U 6U 1.1.1-TRICHLOROETHANE 611 **CHLOROBENZENE**

REMARKS

FOOTNOTES

6U

CARBON TETRACHLORIDE

BROMODICHLOROMETHANE

VINYL ACETATE

REMARKS

6U

6U

6U

ETHYL BENZENE

TOTAL XYLENES

PERCENT MOISTURE

STYRENE

*NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *A-AVERAGE VALUE *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

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EXTRACTABLE ORGANICS DATA REPORT
PROJECT NO. 91-025 SAMPLE NO. 51661 SAMPLE TYPE: SOIL SOURCE: AMAX PHOSPHATE FACIL
                                                                  PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/18/90 1030 STOP: 00/00/00
**
                                                                                                                            ..
..
                                                                                                                            ..
    STATION ID: SB-04
**
                                                                                                                           ..
..
                                                                                                                           * *
** CASE NO.: 15099
                                             SAS NO.:
                                                                   D. NO.: Y174
                                                                                                                            ..
ANALYTICAL RESULTS
   UG/KG
                                                                  UG/KG
                                                                                     ANALYTICAL RESULTS
                                                                 3900UR 3-NITROANILINE
800UR ACENAPHTHENE
3900U 2,4-DINITROPHENOL
   800U PHENOL
   8000 BIS(2-CHLOROETHYL) ETHER
   800U 2-CHLOROPHENOL
   800U 1.3-DICHLOROBENZENE
                                                                  3900U 4-NITROPHENOL
   800U 1.4-DICHLOROBENZENE
                                                                   800U DIBENZOFURAN
   800U BENZYL ALCOHOL
                                                                   800U 2,4-DINITROTOLUENE
   800U 1.2-DICHLOROBENZENE
                                                                   8000 DIETHYL PHTHALATE
   800U 2-METHYLPHENOL
                                                                   800U 4-CHLOROPHENYL PHENYL ETHER
   BOOUR BIS(2-CHLOROISOPROPYL) ETHER
                                                                   800U FLUORENE
   800U (3-AND/OR 4-)METHYLPHENOL
                                                                  3900U 4-NITROANILINE
   BOOU N-NITROSODI-N-PROPYLAMINE
                                                                  3900U 2-METHYL-4,6-DINITROPHENOL
                                                                   BOOU N-NITROSODIPHENYLAMINE/DIPHENYLAMINE
   800U HEXACHLOROETHANE
  800UR NITROBENZENE
                                                                   800U 4-BROMOPHENYL PHENYL ETHER
                                                                   800U HEXACHLOROBENZENE (HCB)
   800U ISOPHORONE
   800U 2-NITROPHENOL
                                                                  3900U PENTACHLOROPHENOL
   800U 2,4-DIMETHYLPHENOL
                                                                   BOOU PHENANTHRENE
   3900U BENZOIC ACID
                                                                   800U ANTHRACENE
   800U BIS(2-CHLOROETHOXY) METHANE
                                                                   800U DI-N-BUTYLPHTHALATE
  800U 2.4-DICHLOROPHENOL
800UR 1.2.4-TRICHLOROBENZENE
                                                                   BOOU FLUORANTHENE
                                                                   800U PYRENE
   800U NAPHTHALENE
                                                                   800U BENZYL BUTYL PHTHALATE
                                                                  1600U 3.3'-DICHLOROBENZIDINE
800U BENZO(A)ANTHRACENE
   800U 4-CHLOROANILINE
   800U HEXACHLOROBUTADIENE
   800U 4-CHLORO-3-METHYLPHENOL
                                                                   800U
                                                                        CHRYSENE
   BOOU 2-METHYLNAPHTHALENE
                                                                   8000
                                                                        BIS(2-ETHYLHEXYL) PHTHALATE
   800U HEXACHLOROCYCLOPENTADIENE (HCCP)
                                                                   800U
                                                                        DI-N-OCTYLPHTHALATE
  800U 2.4.6-TRICHLOROPHENOL 2.4.5-TRICHLOROPHENOL
                                                                   800U BENZO(B AND/OR K)FLUORANTHENE
                                                                   800U BENZO-A-PYRENE
  800UR 2-CHLORONAPHTHALENE
                                                                  800U INDENO (1,2,3-CD) PYRENE
800U DIBENZO(A,H)ANTHRACENE
  3900U 2-NITROANILINE
   8000 DIMETHYL PHTHALATE
                                                                   800U BENZO(GHI)PÉRYLENE
   800U
        ACENAPHTHYLENE
                                                                     18 PERCENT MOISTURE
   800U
        2.6-DINITROTOLUENE
```

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

01/04/91 PESTICIDES/PCB'S DATA REPORT

```
PROJECT NO. 91-025 SAMPLE NO. 51661 SAMPLE TYPE: SOIL
                                                              PROG ELEM: NSF COLLECTED BY: M GORDON
**
                                                              CITY: PALMETTO ST: FL
COLLECTION START: 10/18/90 1030 STOP: 00/00/00
**
    SOURCE: AMAX PHOSPHATE FACIL
                                                                                                                    * *
..
    STATION ID: SB-04
                                                                                                                   * *
    CASE NUMBER: 15099
                             SAS NUMBER:
**
                                                               D. NUMBER: Y174
                                                                                                                    ..
..
ANALYTICAL RESULTS
                                                               UG/KG
                                                                                ANALYTICAL RESULTS
    20U ALPHA-BHC
20U BETA-BHC
                                                               200U METHOXYCHLOR
                                                                   ENDRIN KETONE
                                                               39U
    200 DELTA-BHC
                                                                    CHLORDANE (TECH. MIXTURE) /1
    20U GAMMA-BHC (LINDANE)
                                                                    GAMMA-CHLORDANE
                                                               2000
    300 HEPTACHLOR
                                                               2000
                                                                    ALPHA-CHLORDANE
    20U ALDRIN
                                                               390U
                                                                   TOXAPHENE
    200 HEPTACHLOR EPOXIDE
                                                               200U
                                                                   PCB-1016 (AROCLOR 1016)
                                                                   PCB-1010 (AROCLOR 1016)
PCB-1221 (AROCLOR 1221)
PCB-1232 (AROCLOR 1232)
PCB-1242 (AROCLOR 1242)
PCB-1248 (AROCLOR 1248)
PCB-1254 (AROCLOR 1254)
    20U ENDOSULFAN I (ALPHA)
                                                               200U
    39U DIELDRIN
                                                               200U
    390 4,4'-DDE (P,P'-DDE)
                                                               200U
    39U ENDRIN
                                                               200U
    39U ENDOSULFAN II (BETA)
                                                               390U
    39U 4,4' DDD (P.P' DDD)
                                                               390U PCB-1260 (AROCLOR 1260)
    390 ENDOSULFAN SULFATE
                                                                18 PERCENT MOISTURE
        4,4'-DDT (P.P'-DDT)
```

REMARKS ***REMARKS***

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT. *R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

^{*}C-CONFIRMED BY GCMS 1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

01/04/91

DUDGEARLE ORGANICO DATA REDORT	EPA-REGION IV ESD, ATTENS, GA.	01/04/91
PURGEABLE ORGANICS DATA REPORT		
** PROJECT NO. 91-025 SAMPLE NO. 51665 SAMPLE ** SOURCE: AMAX PROSPHATE FACIL	TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL	**
** STATION ID: SB-05	COLLECTION START: 10/18/90 0910 STOP:	00/00/00
** CASE NO.: 15099 SAS I		
UG/KG ANALYTICAL RESULTS	UG/KG ANALYTICAL RESULTS	
12U CHLOROMETHANE 12U BROMOMETHANE 12U VINYL CHLORIDE 12U CHLOROETHANE 6U METHYLENE CHLORIDE 20U ACETONE 6U CARBON DISULFIDE 6U 1.1-DICHLOROETHENE(1.1-DICHLOROETHYLENE) 6U 1.1-DICHLOROETHANE 6U 1.2-DICHLOROETHENE (TOTAL) 6U CHLOROFORM 6U 1.2-DICHLOROETHANE 12U METHYL ETHYL KETONE 6U 1,1-TRICHLOROETHANE 6U CARBON TETRACHLORIDE 12U VINYL ACETATE 6U BROMODICHLOROMETHANE	6U 1,2-DICHLOROPROPANE 6U CIS-1,3-DICHLOROPROPENE 6U TRICHLOROETHENE (TRICHLOROETHYLENE) 6U DIBROMOCHLOROMETHANE 6U 1,1,2-TRICHLOROETHANE 6U TRANS-1,3-DICHLOROPROPENE 6U BROMOFORM 12U METHYL ISOBUTYL KETONE 12U METHYL BUTYL KETONE 6U TETRACHLOROETHENE (TETRACHLOROETHYL 6U 1,1,2,2-TETRACHLOROETHANE 6U TOLUENE 6U CHLOROBENZENE 6U CHLOROBENZENE 6U STYRENE 6U TOTAL XYLENES 16 PERCENT MOISTURE	

REMARKS

REMARKS

FOOTNOTES *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

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EXTRACTABLE ORGANICS DATA REPORT
** PROJECT NO. 91-025 SAMPLE NO. 51665 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON ***
                                                                                              PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/18/90 0910 STOP: 00/00/00
      SOURCE: AMAX PHOSPHATE FACIL
                                                                                                                                                                              . .
      STATION ID: SB-05
..
                                                                                                                                                                              ..
                                                               SAS NO.:
                                                                                               D. NO.: Y171
    CASE NO.: 15099
                                                                                                                                                                              . .
ANALYTICAL RESULTS
                                                                                             UG/KG
     UG/KG
                                                                                                                        ANALYTICAL RESULTS
                                                                                            3800UR 3-NITROANILINE
     790U PHENOL
                                                                                            3800UR 3-NITROANILINE
790UR ACENAPHTHENE
3800U 2,4-DINITROPHENOL
3800U 4-NITROPHENOL
790U DIBENZOFURAN
790U 2,4-DINITROTOLUENE
790U 01ETHYL PHTHALATE
790U 4-CHLOROPHENYL PHENYL ETHER
790U 1-NITROANILINE
     7900 BIS(2-CHLOROETHYL) ETHER
7900 2-CHLOROPHENOL
     790U 1,3-DICHLOROBENZENE
   790U 1,4-DICHLOROBENZENE
790U 1,4-DICHLOROBENZENE
790U BENZYL ALCOHOL
790U 1,2-DICHLOROBENZENE
790U 2-METHYLPHENOL
790UR BIS(2-CHLOROISOPROPYL) ETHER
     790U (3-AND/OR 4-)METHYLPHENOL
790U N-NITROSODI-N-PROPYLAMINE
                                                                                            3800U 4-NITROANILINE
3800U 2-METHYL-4,6-DINITROPHENOL
790U N-NITROSODIPHENYLAMINE/DIPHENYLAMINE
     790U HEXACHLOROETHANE
                                                                                              790U 4 BROMOPHENYL PHENYL ETHER
    79OUR NITROBENZENE
            ISOPHORONE
                                                                                              790U HEXACHLOROBENZENE (HCB)
     790U
     790U 2-NITROPHENOL
790U 2.4-DIMETHYLPHENOL
8800U BENZOIC ACID___
                                                                                             3800U PENTACHLOROPHENOL
790U PHENANTHRENE
790U ANTHRACENE
790U DI-N-BUTYLPHTHALATE
    38000
            BIS(2-CHLOROETHOXY) METHANE
2,4-DICHLOROPHENOL
     790U
     790U
                                                                                              790U FLUORANTHENE
    790UR
             1,2,4-TRICHLOROBENZENE
                                                                                              790U PYRENE
     790U
            NAPHTHALENE
                                                                                              7900 BENZYL BUTYL PHTHALATE
             4-CHLOROANILINE
                                                                                             1600U 3.3'-DICHLOROBENZIDINE
     790U
     790U HEXACHLOROBUTADIENE
                                                                                              790U BENZO(A)ANTHRACENE
     790U 4-CHLORO-3-METHYLPHENOL
                                                                                              790U CHRYSENE
    7900 2-METHYLNAPHTHALENE
7900 HEXACHLOROCYCLOPENTADIENE (HCCP)
7900 2.4.6-TRICHLOROPHENOL
38000 2.4.5-TRICHLOROPHENOL
                                                                                              790U BIS(2-ETHYLHEXYL) PHTHALATE
790U DI-N-OCTYLPHTHALATE
790U BENZO(B AND/OR K)FLUORANTHENE
790U BENZO-A-PYRENE
    790UR 2-CHLORONAPHTHALENE
                                                                                              790U INDENO (1,2,3-CD) PYRENE
    3800U 2-NITROANILINE
                                                                                              790U DIBENZO(A,H)ANTHRACENE
     790U DIMETHYL PHTHALATE
                                                                                              790U
                                                                                                      BENZO(GHI)PERYLENE
     790U ACENAPHTHYLENE
                                                                                                 16
                                                                                                      PERCENT MOISTURE
     790U 2.6-DINITROTOLUENE
```

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

^{*}R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

01/04/91 PESTICIDES/PCB'S DATA REPORT ** PROJECT NO. 91-025 SAMPLE NO. 51665 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON ** SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO ST: FL **

STATION ID: SB-05 COLLECTION START: 10/18/90 0910 STOP: 00/00/00 .. * * CASE NUMBER: 15099 SAS NUMBER: D. NUMBER: Y171 .. * * ..

ANALYTICAL RESULTS UG/KG UG/KG ANALYTICAL RESULTS

19U ALPHA-BHC 1900 METHOXYCHLOR 19U BETA-BHC 38U ENDRIN KETONE CHLORDANE (TECH. MIXTURE) /1 GAMMA-CHLORDANE /2 19U DELTA-BHC GAMMA-BHC (LINDANE) 1900 190 19U HEPTACHLOR ALPHA-CHLORDANE 1900 19U ALDRIN 3800 TOXAPHENE PCB-1016 (AROCLOR 1016) PCB-1221 (AROCLOR 1221) 19U HEPTACHLOR EPOXIDE 190U 19U ENDOSULFAN I (ALPHA) 1900 38U DIELDRIN 190U PCB-1232 (AROCLOR 1232) 190U PCB-1242 (AROCLOR 1242) 190U PCB-1248 (AROCLOR 1248) 380U PCB-1254 (AROCLOR 1254) 380U PCB-1260 (AROCLOR 1260) 38U 4,4'-DDE (P.P'-DDE) 38U ENDRIN 380 ENDOSULFAN II (BETA) 38U 4.4'-DDD (P.P'-DDD) 38U ENDOSULFAN SULFATE PERCENT MOISTURE 16

REMARKS

4.4'-DDT (P.P'-DDT)

REMARKS

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*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
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^{1.} WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS. *C-CONFIRMED BY GCMS

01/04/91

PURGEABLE ORGANICS DATA REPORT		01,04,01
*** PROJECT NO. 91-025 SAMPLE NO. 51670 SAMPLE SOURCE: ** STATION ID: SB-06	TYPE: PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1215 STOP: 00/	/00/00
UG/KG ANALYTICAL RESULTS	O.: D. NO.: Y155 **********************************	
12U CHLOROMETHANE 12U BROMOMETHANE 12U VINYL CHLORIDE 12U CHLOROETHANE 20U METHYLENE CHLORIDE 12U ACETONE 6U CARBON DISULFIDE 6U 1.1-DICHLOROETHENE(1.1-DICHLOROETHYLENE) 6U 1.1-DICHLOROETHANE 6U 1.2-DICHLOROETHENE (TOTAL) 6U CHLOROFORM 6U 1.2-DICHLOROETHANE 12U METHYL ETHYL KETONE 6U 1.1-TRICHLOROETHANE 6U CARBON TETRACHLORIDE 12U VINYL ACETATE 6U BROMODICHLOROMETHANE	6U 1.2-DICHLOROPROPANE 6U CIS-1.3-DICHLOROPROPENE 6U TRICHLOROETHENE(TRICHLOROETHYLENE) 6U DIBROMOCHLOROMETHANE 6U DIBROMOCHLOROETHANE 6U BENZENE 6U TRANS-1.3-DICHLOROPROPENE 6U BROMOFORM 12U METHYL ISOBUTYL KETONE 12U METHYL ISOBUTYL KETONE 12U METHYL BUTYL KETONE 6U TETRACHLOROETHENE(TETRACHLOROETHYLENE) 6U 1.1.2.2-TETRACHLOROETHANE 3J TOLUENE 6U CHLOROBENZENE 6U CHLOROBENZENE 6U STYRENE 6U TOTAL XYLENES 16 PERCENT MOISTURE)

REMARKS

REMARKS

FOOTNOTES *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
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REGION IV ESD, ATHENS, GA. 01/04/91

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EXTRACTABLE ORGANICS DATA REPORT
PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL
    PROJECT NO. 91-025 SAMPLE NO. 51670 SAMPLE TYPE:
**
    SOURCE:
. .
                                                                                                                         ..
                                                                 COLLECTION START: 10/17/90 1215 STOP: 00/00/00
    STATION ID: SB-06
..
                                                                                                                         .
                                                                                                                         ..
                                            SAS NO.:
  CASE NO.: 15099
                                                                  D. NO.: Y155
                                                                                                                         ..
ANALYTICAL RESULTS
                                                                UG/KG
                                                                                   ANALYTICAL RESULTS
   UG/KG
   790U PHENOL
790U BIS(2-CHLOROETHYL) ETHER
790U 2-CHLOROPHENOL
                                                               3800UR 3-NITROANILINE
790U ACENAPHTHENE
                                                                 3800U 2.4-DINITROPHENOL
   790U 1.3-DICHLOROBENZENE
                                                                3800U 4-NITROPHENOL
   790U 1.4-DICHLOROBENZENE
                                                                 790U DIBENZOFURAN
   790U BENZYL ALCOHOL
                                                                 790U 2.4-DINITROTOLUENE
   790U 1.2-DICHLOROBENZENE
                                                                 790U DIETHYL PHTHALATE
   790U 2-METHYLPHENOL
                                                                 790U
                                                                       4-CHLOROPHENYL PHENYL ETHER
   790UR BIS(2-CHLOROISOPROPYL) ETHER
                                                                 790U FLUORENE
   790U (3-AND/OR 4-)METHYLPHÉNOL
790U N-NITROSODI-N-PROPYLAMINE
                                                                38000
                                                                       4-NITROANILINE
                                                                       2-METHYL-4,6-DINITROPHENOL
                                                                38000
   790U HEXACHLOROETHANE
                                                                       N-NITROSODIPHENYLAMINE/DIPHENYLAMINE
                                                                 790U
  79OUR NITROBENZENE
                                                                 790Ŭ
                                                                       4 BROMOPHENYL PHENYL ETHER
   790U ISOPHORONE
                                                                       HEXACHLOROBENZENE (HCB)
                                                                 790U
   790U 2-NITROPHENOL
                                                                38000
                                                                       PENTACHLOROPHENOL
   790U 2,4-DIMETHYLPHENOL
                                                                 790U PHENANTHRENE
  3800U BÉNZOIC ACID
                                                                 790U
                                                                       ANTHRACENE
   790U BIS(2-CHLOROETHOXY) METHANE
                                                                 790U
                                                                       DI-N-BUTYLPHTHALATE
   790U 2,4-DICHLOROPHENOL
'90UR 1,2,4-TRICHLOROBENZENE
                                                                 790U
                                                                       FLUORANTHENE
  790UR
                                                                 790U
                                                                       PYRENE
   790U NAPHTHALENE
                                                                 790Ŭ
                                                                       BENZYL BUTYL PHTHALATE
   790U 4-CHLOROANILINE
                                                                 16000
                                                                       3,3'-DICHLOROBENZIDINE
                                                                       BÉNZO(A)ANTHRACENE
   790U HEXACHLOROBUTADIENE
                                                                 790U
   790U 4-CHLORO-3-METHYLPHENOL
                                                                 790U
                                                                       CHRYSENE
   790U 2-METHYLNAPHTHALENE
                                                                       BIS(2-ETHYLHEXYL) PHTHALATE
                                                                 790U
   790U HEXACHLOROCYCLOPENTADIENE (HCCP)
                                                                       DI-N-OCTYLPHTHALATE
                                                                 790U
  790U 2.4.6-TRICHLOROPHENOL
3800U 2.4.5-TRICHLOROPHENOL
                                                                 790U
                                                                       BENZO(B AND/OR K)FLUORANTHENE
                                                                 79011
                                                                       BENZO-A-PYRENE
   790UR 2-CHLORONAPHTHALENE
                                                                       INDENO (1,2,3-CD) PYRENE
DIBENZO(A,H)ANTHRACENE
                                                                 790U
  3800U 2-NITROANILINE
                                                                 790U
   790U DIMETHYL PHTHALATE
                                                                 790U
                                                                       BENZO(GHI)PERYLENE
   790U ACENAPHTHYLENE
                                                                   16 PERCENT MOISTURE
   790U 2.6-DINITROTOLUENE
```

REMARKS

REMARKS

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*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
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^{*}U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE WINIMUM QUANTITATION LIMIT. *R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM

EPA-REGION IV ESD, ATHENS, GA. 01/04/91 PESTICIDES/PCB'S DATA REPORT

PROG ELEM: NSF COLLECTED BY: M GORDON SAMPLE NO. 51670 SAMPLE TYPE: PROJECT NO. 91-025 CITY: PALMETTO ST: FL STATION ID: SB-06 COLLECTION START: 10/17/90 1215 STOP: 00/00/00 .. * * SAS NUMBER: CASE NUMBER: 15099 D. NUMBER: Y155 * * ANALYTICAL RESULTS UG/KG **ANALYTICAL RESULTS** UG/KG 190U 19U ALPHA-BHC METHOXYCHLOR 380 19U BETA-BHC **ENDRIN KETONE** 19U DELTA-BHC CHLORDANE (TECH. MIXTURE) /1 19U GAMMA-BHC (LINDANE) 190U GAMMA-CHLORDANE /2 19U HEPTACHLOR 1900 ALPHA-CHLORDANE 19U ALDRIN 380U TOXAPHENE 19U HEPTACHLOR EPOXIDE 1900 PCB-1016 (AROCLOR 1016) 19U ENDOSULFAN I (ALPHA) 1900 PCB-1221 (AROCLOR 1221) PCB-1232 (AROCLOR 1232) 38U DIELDRIN 1900 PCB-1242 (AROCLOR 1242) PCB-1248 (AROCLOR 1248) 38U 4.4'-DDE (P.P'-DDE) 190U 38U ENDRIN 190U 38U ENDOSULFAN II (BETA) 38U 4,4' DDD (P,P' DDD) 38U ENDOSULFAN SULFATE 380U PCB-1254 (AROCLOR 1254) 380U PCB-1260 (AROCLOR 1260) PERCENT MOISTURE 16

REMARKS

4.4'-DDT (P.P'-DDT)

REMARKS

FOOTNOTES

*A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
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1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS. *C-CONFIRMED BY GCMS

01/04/91

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MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT

SAMPLE NO. 51670 SAMPLE TYPE: PROG ELEM: NSF COLLECTED BY: M GORDON PROJECT NO. 91-025 CITY: PALMETTO ..

SOURCE:

CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1215 STOP: 00/00/00 D. NO.: Y155 MD NO: Y155 STATION ID: SB-06 SAS NO .:

CASE .NO .: 15099 ** ..

ANALYTICAL RESULTS UG/KG

1000Ĵ 1 UNIDENTIFIED COMPOUND

FOOTNOTES

**

**

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

01/04/91

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PESTICIDES/PCB'S DATA REPORT
PROJECT NO. 91-025 SAMPLE NO. 51675 SAMPLE TYPE: SOIL
                                                           PROG ELEM: NSF COLLECTED BY: M GORDON
                                                                                                             . .
    SOURCE: AMAX PHOSPHATE FACIL
                                                           CITY: PALMETTO
                                                                                  ST: FL
                                                                                                             * *
                                                           COLLECTION START: 10/16/90 1335 STOP: 00/00/00
    STATION ID: SD-01
                                                                                                             * *
   CASE NUMBER: 15099
                           SAS NUMBER:
                                                            D. NUMBER: Y136
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                                                                                                             . .
..
                                                                                                             **
   ANALYTICAL RESULTS
                                                           UG/KG
   UG/KG
                                                                            ANALYTICAL RESULTS
    20U ALPHA-BHC
                                                           200U METHOXYCHLOR
    20U BETA-BHC
                                                            41U ENDRIN KETONE
    200 DELTA-BHC
                                                                CHLORDANE (TECH. MIXTURE) /1
    20U GAMMA-BHC (LINDANE)
                                                           200U GAMMA-CHLORDANE
                                                           200U ALPHA-CHLORDANE
    20U
       HEPTACHLOR
    20U
        ALDRIN
                                                           410U
                                                                TOXAPHENE
        HEPTACHLOR EPOXIDE
                                                           200U PCB-1016 (AROCLOR 1016)
200U PCB-1221 (AROCLOR 1221)
    20U
        ENDOSULFAN I (ALPHA)
    20U
                                                           2000 PCB-1232 (AROCLOR 1232)
2000 PCB-1242 (AROCLOR 1242)
2000 PCB-1248 (AROCLOR 1248)
       DIELDRIN
    41U
    41U 4.4'-DDE (P.P'-DDE)
    41U ENDRIN
    41U ENDOSULFAN II (BETA)
                                                           410U PCB-1254 (AROCLOR 1254)
    41U 4.4' DDD (P.P' DDD)
                                                           410U PCB 1260 (AROCLOR 1260)
    41U ENDOSULFAN SULFATE
                                                            21 PERCENT MOISTURE
    41U 4.4'-DDT (P.P'-DDT)
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REMARKS

REMARKS

[•]A-AVERAGE VALUE •NA-NOT ANALYZED •NAI-INTERFERENCES •J-ESTIMATED VALUE •N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

^{*}K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.
*C-CONFIRMED BY GCMS

1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM

EPA-REGION IV ESD, ATHENS, GA. 01/04/91

PROJECT NO. 91-025 SAMPLE NO. 51675 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL CITY: PALMETTO ST: FL COLLECTION START: 10/16/90 1335 STOP: 00/00/00 STATION ID: SD-01 SAS NO.: ** CASE NO : 15099 D. NO.: Y136 .. ANALYTICAL RESULTS UG/KG UG/KG ANALYTICAL RESULTS 840U PHENOL 4100UR 3-NITROANILINE 840U BIS(2-CHLOROETHYL) ETHER 840U 2-CHLOROPHENOL 840U ACENAPHTHENE 4100U 2,4-DINITROPHENOL 1,3-DICHLOROBENZENE 840U 4100U 4-NITROPHENOL 1.4-DICHLOROBENZENE 840U 840U DIBENZOFURAN BENZYL ALCOHOL

1,2-DICHLOROBENZENE 840U 840U 2,4-DINITROTOLUENE 8400 DIETHYL PHTHALATE 840U 840U 4-CHLOROPHENYL PHENYL ETHER 840U 2-METHYLPHENOL 840UR BIS(2-CHLOROISOPROPYL) ETHER 840U FLUORENE 840U (3-AND/OR 4-)METHYLPHENOL 4100U 4-NITROANILINE 840U N-NITROSODI-N-PROPYLAMINE 4100U 2-METHYL-4,6-DINITROPHENOL 840U HEXACHLOROETHANE 840U N-NITROSODIPHENYLAMINE/DIPHENYLAMINE 840UR NITROBENZENE 840U 4 BROMOPHENYL PHENYL ETHER ISOPHORONE 840U HEXACHLOROBENZENE (HCB) 840U 840U 2-NITROPHENOL 4100U PENTACHLOROPHENOL 840U 2,4-DIMETHYLPHENOL 580J PHENANTHRENE ANTHRACENE. DI-N-BUTYLPHTHALATE 4100U BENZOIC ACID 140J 840U BIS(2-CHLOROETHOXY) METHANE (840Ŭ 1400 2,4-DICHLOROPHENOL 840U FLUORANTHENE 1,2,4-TRICHLOROBENZENE PYRENE 840UR 750J NAPHTHALENE 840U BENZYL BUTYL PHTHALATE 840U 840U 4-CHLOROANILINE 17000 3.3'-DICHLOROBENZIDINE HEXACHLOROBUTADIENE BENZO(A)ANTHRACENE 840U 330J CHRYSÈNÉ 840U 4-CHLORO-3-METHYLPHENOL 500J . 840Ŭ 2-METHYLNAPHTHALENE 840U BIS(2-ETHYLHEXYL) PHTHALATE 840U HEXACHLOROCYCLOPENTADIENE (HCCP) 840U DI-N-OCTYLPHTHALATE 2.4.6-TRICHLOROPHENOL 2.4.5-TRICHLOROPHENOL 840U BENZO(B AND/OR K)FLUORANTHENE BENZO-A-PYRENE 440J 4100U 380J 840UR 2-CHLORONAPHTHALENE 220J INDENO'(1,2,3-CD) PYRENE 840U DIBENZO(A,H)ANTHRACENE 2-NITROANILINE 4100U 840U DIMETHYL PHTHALATE 840U ACENAPHTHYLENE 210J BENZO(GHI)PÉRYLENE PERCENT MOISTURE 840U 2.6-DINITROTOLUENE

REMARKS

REMARKS

FOOTNOTES

*A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

01/04/91

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MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT

PROJECT NO. 91-025 SAMPLE NO. 51675 SAMPLE TYPE: SOIL

SOURCE: AMAX PHOSPHATE FACIL

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STATION ID: SD-01

CASE . NO .: 15099 SAS NO.: PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO

ST: FL

COLLECTION START: 10/16/90 1335 STOP: 00/00/00

D. NO.: Y136 MD NO: Y136

ANALYTICAL RESULTS UG/KG

2000J 2 UNIDENTIFIED COMPOUNDS

9001N 3001N HEXADECANOIC ACID ANTHRACENEDIONE

BENZOFLUORENE 200JN BENZOFLUORANTHENE (NOT B OR K)

500JN BENZACEPHENANTHRYLENE

^{*}NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *A-AVERAGE VALUE *NA-NOT ANALYZED *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

^{*}R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REAMALYSTS

01/04/91 **PURGEABLE ORGANICS DATA REPORT** PROJECT NO. 91-025 SAMPLE NO. 51675 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO ST: FL COLLECTION START: 10/16/90 1335 STOP: 00/00/00 .. STATION ID: SD-01 * * SAS NO.: D. NO.: Y136 .. CASE NO.: 15099 . . ANALYTICAL RESULTS UG/KG ANALYTICAL RESULTS UG/KG 13U CHLOROMETHANE 6U 1.2-DICHLOROPROPANE BROMOMETHANE CIS-1,3-DICHLOROPROPENE 130 6U VINYL CHLORIDE 6U TRICHLOROETHENE (TRICHLOROETHYLENE) 130 CHLOROE THANE DIBROMOCHLOROMETHANE 130 METHYLENE CHLORIDE 6U 1.1.2-TRICHLOROETHANE 130 **ACETONE** 6U BENZENE TRANS-1, 3-DICHLOROPROPENE CARBON DISULFIDE 6U 1.1-DICHLOROETHENE(1.1-DICHLOROETHYLENE) **BROMOFORM** 6U 60 1.1-DICHLOROETHANE METHYL ISOBUTYL KETONE METHYL BUTYL KETONE 6U 130 1,2-DICHLOROETHENE (TOTAL) 6U 130 CHLOROFORM TETRACHLOROETHENE (TETRACHLOROETHYLENE) 6U 6U 1,2-DICHLOROETHANE 1,1,2,2-TETRACHLOROETHANE 6U 6U METHYL ETHYL KETONE 130 6U TOLUENE 6U 1.1.1-TRICHLOROETHANE CHLOROBENZENE 60 CARBON TETRACHLORIDE ETHYL BENZENE 130 VINYL ACETATE STYRENE 6U BROMODICHLOROMETHANE TOTAL XYLENES 6U PERCENT MOISTURE

REMARKS

REMARKS

^{*}A~AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

^{*}K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

^{*}R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

01/04/91

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MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT

PROJECT NO. 91-025 SAMPLE NO. 51678 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON

SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO ST: FL

STATION ID: SD-02 CASE.NO.: 15099 COLLECTION START: 10/16/90 1420 STOP: 00/00/00 SAS NO.: D. NO.: Y140 MD NO: Y140 ..

ANALYTICAL RESULTS UG/KG

50000J-9 15 UNIDENTIFIED COMPOUNDS

PETROLEUM PRODUCT 1000JN HEXADECANOIC ACID

FOOTNOTES

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^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MAJERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

01/04/91 PESTICIDES/PCB'S DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51678 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO ST: FL STATION ID: SD-02 COLLECTION START: 10/16/90 1420 STOP: 00/00/00 SAS NUMBER: D. NUMBER: Y140 CASE NUMBER: 15099 UG/KG ANALYTICAL RESULTS UG/KG **ANALYTICAL RESULTS** 50U ALPHA-BHC **500U METHOXYCHLOR** 500 BETA-BHC 100U ENDRIN KETONE CHLORDANE (TECH. MIXTURE) /1 GAMMA-CHLORDANE /2 50U DELTA-BHC GAMMA-BHC (LINDANE) 500U 50U 50U HEPTACHLOR 500U ALPHA-CHLORDANE 50U ALDRIN 10000 TOXAPHENE 50U HEPTACHLOR EPOXIDE 500U PCB-1016 (AROCLOR 1016) 500 ENDOSULFAN I (ALPHA) 500U PCB-1221 (AROCLOR 1221) 100U DIELDRIN 500U PCB-1232 (AROCLOR 1232) 1000 4.4'-DDE (P.P'-DDE) 500Ü PCB-1242 (AROCLOR 1242) PCB-1248 (AROCLOR 1248) PCB-1254 (AROCLOR 1254) PCB-1260 (AROCLOR 1260) 1000 ENDRIN 500U ENDOSULFAN II (BETA) 1000 1000U 100U 4,4' DDD (P.P' DDD) 100U ENDOSULFAN SULFATE

10000

68

PERCENT MOISTURE

REMARKS

1000

4.4'-DDT (P.P'-DDT)

REMARKS

FOOTNOTES *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL **A-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.
*C-CONFIRMED BY GCMS

1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM

EPA-REGION IV ESD. ATHENS. GA. 01/04/91 PURGEABLE ORGANICS DATA REPORT

** PROJECT NO. 91-025 SAMPLE NO. 51678 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON PROG ELEM: NSF COLLECTED BY: M GORDON SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO ST: FL * * STATION ID: SD-02 COLLECTION START: 10/16/90 1420 STOP: 00/00/00 . . ** SAS NO.: D. NO.: Y140 CASE NO.: 15099 ANALYTICAL RESULTS UG/KG UG/KG **ANALYTICAL RESULTS** 31U CHLOROMETHANE 16U 1.2-DICHLOROPROPANE 31U BROMOMETHANE 16U CIS-1,3-DICHLOROPROPENE 310 VINYL CHLORIDE 16U TRICHLOROETHENE (TRICHLOROETHYLENE) 31U CHLOROETHANE DIBROMOCHLOROME THANE 160 16U METHYLENE CHLORIDE 160 1,1,2-TRICHLOROETHANE 160 BENZENE 31U ACETONE CARBON DISULFIDE 160 TRANS-1, 3-DICHLOROPROPENE 10J 16U 1.1-DICHLOROETHENE(1.1-DICHLOROETHYLENE) 160 **BROMOFORM** 1.1-DICHLOROETHANE 16U 310 METHYL ISOBUTYL KETONE 1.2-DICHLOROETHENE (TOTAL) 160 310 METHYL BUTYL KETONE CHLOROFORM TETRACHLOROETHENE (TETRACHLOROETHYLENE) 160 160 1,2-DICHLOROETHANE 16U 16U 1,1,2,2-TETRACHLOROETHANE 3111 METHYL ETHYL KETONE 16U TÓLUENE 160 1.1.1-TRICHLOROETHANE CHLOROBENZENE 160 CARBON TETRACHLORIDE ETHYL BENZENE 16U 16U VINYL ACETATE 310 160 STYRENE BROMODICHLOROMETHANE 16U TOTAL XYLENES 160

REMARKS

REMARKS

68

PERCENT MOISTURE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

^{*}R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

01/04/91 EXTRACTABLE ORGANICS DATA REPORT ** PROJECT NO. 91-025 SAMPLE NO. 51678 SAMPLE TYPE: SOIL

** SOURCE: AMAX PHOSPHATE FACIL

** STATION ID: SD-02

** COLLECTION START: 10/16/90 1420 STOP: 00/00/00

** SAS NO.: D. NO.: Y140 ** CASE NO.: 15099 . UG/KG ANALYTICAL RESULTS UG/KG ANALYTICAL RESULTS 10000UR 3-NITROANILINE 2100U ACENAPHTHENE 10000U 2.4-DINITROPHENOL 10000U 4-NITROPHENOL 2100U PHENOL 2100U BIS(2-CHLOROETHYL) ETHER 2100U 2-CHLOROPHENOL 2100U 1.3-DICHLOROBENZENE 2100U 1.4-DICHLOROBENZENE 2100U DIBENZOFURAN 2100U BENZYL ALCOHOL 2100U 1,2-DICHLOROBENZENE 2100U 2.4-DINITROTOLUENE 2100U DIETHYL PHTHALATE 2100U 2-METHYLPHENOL 2100U 4-CHLOROPHENYL PHENYL ETHER 2100UR BIS(2-CHLOROISOPROPYL) ETHER 2100U FLUORENE 2100U (3-AND/OR 4-)METHYLPHENOL 10000U 4-NITROANILINE 2100U N-NITROSODI-N-PROPYLAMINE 10000U 2-METHYL-4,6-DINITROPHENOL 2100U N-NITROSODIPHENYLAMINE/DIPHENYLAMINE 2100U HEXACHLOROETHANE 2100U 4-BROMOPHENYL PHENYL ETHER 2100U HEXACHLOROBENZENE (HCB) 2100UR NITROBENZENE 2100U ISOPHORONE 2100U 2-NITROPHENOL 10000U PENTACHLOROPHENOL 2100U 2,4-DIMETHYLPHENOL 2100U PHENANTHRENE 2100U ANTHRACENE 2100U DI-N-BUTYLPHTHALATE 10000U BÉNZOIC ACID 2100U BIS(2-CHLOROETHOXY) METHANE 2100U 2,4-DICHLOROPHENOL 2100U FLUORANTHENE 2100UR 1,2,4-TRICHLOROBENZENE 2100U PYRENE 2100U NAPHTHALENE 21000 BENZYL BUTYL PHTHALATE 4100U 3,3'-DICHLOROBENZIDINE 2100U 4-CHLOROANILINE 2100U HEXACHLOROBUTADIENE 2100U BENZO(A)ANTHRACENE 2100U 4-CHLORO-3-METHYLPHENOL 2100U CHRYSENÉ 21000 BIS(2-ETHYLHEXYL) PHTHALATE 2100U 2-METHYLNAPHTHALENE 2100U DI-N-OCTYLPHTHALATE
2100U BENZO(B AND/OR K)FLUORANTHENE
2100U BENZO-A-PYRENE 2100U HEXACHLOROCYCLOPENTADIENE (HCCP) 2100U 2.4.6-TRICHLOROPHENOL 10000U 2.4.5-TRICHLOROPHENOL 2100U INDENO (1,2,3-CD) PYRENE 2100UR 2-CHLORONAPHTHALENE 10000U 2-NITROANILINE 2100U DIBENZO(A, H)ANTHRACENE

REMARKS

2100U

2100U DIMETHYL PHTHALATE 2100U ACENAPHTHYLENE

2,6-DINITROTOLUENE

REMARKS

2100U BENZO(GHI)PERYLENE 68 PERCENT MOISTURE

FOOTNOTES

*A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN

*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

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01/04/91 PURGEABLE ORGANICS DATA REPORT PROG ELEM: NSF COLLECTED BY: M GORDON PROJECT NO. 91-025 SAMPLE NO. 51645 SAMPLE TYPE: CITY: PALMETTO . . SOURCE: ST: FL . . STATION ID: SD-04 COLLECTION START: 10/17/90 1630 STOP: 00/00/00 * * SAS NO.: CASE NO.: 15099 D. NO.: Y166 * * . * * * UG/KG ANALYTICAL RESULTS UG/KG **ANALYTICAL RESULTS** CHLOROMETHANE 6U 1.2-DICHLOROPROPANE BROMOMETHANE 6U CIS-1,3-DICHLOROPROPENE 6U TRICHLOROETHENE (TRICHLOROETHYLENE) 130 VINYL CHLORIDE 130 CHLOROE THANE 6U DIBROMOCHLOROMETHANE 70 METHYLENE CHLORIDE 6U 1.1.2-TRICHLOROETHANE BÉNZĒNE 130 6U ACETONE CARBON DISULFIDE 6U TRANS-1, 3-DICHLOROPROPENE 6U 1,1-DICHLOROETHENE(1,1-DICHLOROETHYLENE) BROMOFORM 6U 1.1-DICHLOROETHANE 130 METHYL ISOBUTYL KETONE 1.2-DICHLOROETHENE (TOTAL) 6U 130 METHYL BUTYL KETONE 6U CHLOROFORM TETRACHLOROETHENE (TETRACHLOROETHYLENE) 6U 6Ú 6U 1,2-DICHLOROETHANE 1,1,2,2-TETRACHLOROETHANE 13U METHYL ETHYL KETONE 6U TOLUENE 6U 1.1.1-TRICHLOROETHANE 6U CHLOROBENZENE 6U CARBON TETRACHLORIDE 6U ETHYL BENZENE VINYL ACETATE 6U STYRENE 13U BROMODICHLOROMETHANE TOTAL XYLENES 6U 6U PERCENT MOISTURE

REMARKS

REMARKS

F001N01E5

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

^{*}R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

01/04/91

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PESTICIDES/PCB'S DATA REPORT
** PROJECT NO. 91-025 SAMPLE NO. 51643 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON **
                                                                 PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL
    SOURCE: AMAX PHOSPHATE FACIL
..
                                                                                                                          . .
                                                                  COLLECTION START: 10/15/90 1655 STOP: 00/00/00
    STATION ID: SD-05
                                                                                                                          ..
                               SAS NUMBER:
                                                                  D. NUMBER: Y168
    CASE NUMBER: 15099
                                                                                                                          ..
                                                                                                                         * *
ANALYTICAL RESULTS
                                                                  UG/KG
                                                                                    ANALYTICAL RESULTS
   UG/KG
                                                                  210U METHOXYCHLOR
    21U ALPHA-BHC
    21U BETA-BHC
                                                                   430
                                                                       ENDRIN KETONE
    21U DELTA-BHC
                                                                       CHLORDANE (TECH. MIXTURE) /1
    21U GAMMA-BHC (LINDANE)
                                                                  210U GAMMA-CHLORDANE
                                                                                       /2
    30U HEPTACHLOR
                                                                  210U ALPHA-CHLORDANE
    210
         ALDRIN
                                                                  430U TOXAPHENE
                                                                  210U PCB-1016 (AROCLOR 1016)
210U PCB-1221 (AROCLOR 1221)
210U PCB-1232 (AROCLOR 1232)
         HEPTACHLOR EPOXIDE
    210
    210
         ENDOSULFAN I (ALPHA)
    43U
         DIELDRIN
    43U 4,4'-DDE (P.P'-DDE)
43U ENDRIN
                                                                  210Ŭ
                                                                       PCB-1242 (AROCLOR 1242)
                                                                  210U PCB-1248 (AROCLOR 1248)
                                                                  430U PCB-1254 (AROCLOR 1254)
430U PCB 1260 (AROCLOR 1260)
    43U ENDOSULFAN II (BETA)
    43U 4,4' DDD (P,P' DDD)
    43U ENDOSULFAN SULFATE
                                                                   25 PERCENT MOISTURE
    43U 4.4'-DDT (P.P'-DDT)
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REMARKS

REMARKS

^{*}NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *A-AVERAGE VALUE

^{*}K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

^{*}C-CONFIRMED BY GCMS 1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

01/04/91

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MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT

PROJECT NO. 91-025 SAMPLE NO. 51643 SAMPLE TYPE: SOIL

SOURCE: AMAX PHOSPHATE FACIL

STATION ID: SD-05 CASE.NO : 15099

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SAS NO.:

PROG ELEM: NSF COLLECTED BY: M GORDON

CITY: PALMETTO ST: FL
COLLECTION START: 10/15/90 1655 STOP: 00/00/00
D. NO.: Y168 MD NO: Y168

ANALYTICAL RESULTS UG/KG

3000J 3 UNIDENTIFIED COMPOUNDS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

^{*}R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

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EXTRACTABLE ORGANICS DATA REPORT
PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/15/90 1655 STOP: 00/00/00
     PROJECT NO. 91-025 SAMPLE NO. 51643 SAMPLE TYPE: SOIL
                                                                                                                                                    . .
     SOURCE: AMAX PHOSPHATE FACIL
. .
     STATION ID: SD-05
. .
                                                                                                                                                    ..
                                                                                                                                                    * *
** CASE NO.: 15099
                                                     SAS NO.:
                                                                                 D. NO.: Y168
                                                                                                                                                    * *
ANALYTICAL RESULTS
                                                                                                      ANALYTICAL RESULTS
    880U PHENOL
880U BIS(2-CHLOROETHYL) ETHER
880U 2-CHLOROPHENOL
                                                                              4300UR 3-NITROANILINE
880UR ACENAPHTHENE
4300U 2,4-DINITROPHENOL
4300U 4-NITROPHENOL
    880U 1.3-DICHLOROBENZENE
                                                                                880U DIBENZOFURAN
    880U 1.4-DICHLOROBENZENE
    880U BENZYL ALCOHOL
880U 1,2-DICHLOROBENZENE
                                                                                880U 2.4-DINITROTOLUENE
                                                                                880U DIETHYL PHTHALATE
    880U 2-METHYLPHENOL
                                                                                880U 4-CHLOROPHENYL PHENYL ETHER
                                                                               880U FLUORENE
4300U 4-NITROANILINE
4300U 2-METHYL-4,6-DINITROPHENOL
880U N-NITROSODIPHENYLAMINE/DIPHENYLAMINE
   BBOUR BIS(2-CHLOROISOPROPYL) ETHER
    880U (3-AND/OR 4-)METHYLPHÉNOL
880U N-NITROSODI-N-PROPYLAMINE
    880U HEXACHLOROETHANE
   880UR NITROBENZENE
                                                                                880U 4 BROMOPHENYL PHENYL ETHER
   880U ISOPHORONE
880U 2-NITROPHENOL
880U 2,4-DIMETHYLPHENOL
4300U BENZOIC ACID
                                                                                880U HEXACHLOROBENZENE (HCB)
                                                                               4300U PENTACHLOROPHENOL
                                                                                750J PHENANTHRENE
                                                                                880U ANTHRACENE
   880U BIS(2-CHLOROETHOXY) METHANE
880U 2.4-DICHLOROPHENOL
880UR 1.2.4-TRICHLOROBENZENE
880U NAPHTHALENE
                                                                                880U DI-N-BUTYLPHTHALATE
                                                                                1300 FLUORANTHENE
                                                                                720J PYRENE
                                                                                880U BENZYL BUTYL PHTHALATE
1800U 3.3'-DICHLOROBENZIDINE
120J BENZO(A)ANTHRACENE
    880U 4-CHLOROANILINE
                                                                               18000
    880U HEXACHLOROBUTADIENE
    880U 4-CHLORO-3-METHYLPHENOL
                                                                                420J
                                                                                       CHRYSÈNÉ
    880U 2-METHYLNAPHTHALENE
                                                                                880U BIS(2-ETHYLHEXYL) PHTHALATE
880U DI-N-OCTYLPHTHALATE
    880U HEXACHLOROCYCLOPENTADIENE (HCCP)
   880U 2.4.6-TRICHLOROPHENOL
4300U 2.4.5-TRICHLOROPHENOL
                                                                                270J BENZO(B AND/OR K)FLUORANTHENE
210J BENZO-A-PYRENE
   880UR 2-CHLORONAPHTHALENE
4300U 2-NITROANILINE
                                                                                880U INDENO (1.2.3-CD) PYRENE
880U DIBENZO(A.H)ANTHRACENE
    880U DIMETHYL PHTHALATE
                                                                                880U BENZO(GHI)PERYLENE
    880U ACENAPHTHYLENE
                                                                                  25 PERCENT MOISTURE
    880U 2.6-DINITROTOLUENE
```

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

01/04/91

DUDGEARIE ORGANICO DATA DERORT	EPA-REGION IV ESU, ATH	IENS, GA.	01/04/91
PURGEABLE ORGANICS DATA REPORT			
PROJECT NO. 91-025 SAMPLE NO. 5164 SOURCE: AMAX PHOSPHATE FACIL STATION ID: SD-05	3 SAMPLE TYPE: SOIL PROG CITY	ELEM: NSF COLLECTED BY: M GORDO : PALMETTO ST: FL ECTION START: 10/15/90 1655 STO)N **
	SAS NO.: D.	NO.: Y168	••
UG/KG ANALYTICAL RESULTS	SAS NO.: D. UG/KG		* * * * * * * * * * * * * * * * * * * *
13U CHLOROMETHANE 13U BROMOMETHANE 13U VINYL CHLORIDE 13U CHLOROETHANE 7U METHYLENE CHLORIDE 13U ACETONE 7U CARBON DISULFIDE 7U 1,1-DICHLOROETHENE(1,1-DICHLOROE 7U 1,2-DICHLOROETHANE 7U 1,2-DICHLOROETHANE 7U CHLOROFORM 7U 1,2-DICHLOROETHANE 13U METHYL ETHYL KETONE 7U 1,2-DICHLOROETHANE 13U METHYL ETHYL KETONE 7U 1,1,1-TRICHLOROETHANE 7U CARBON TETRACHLORIDE 13U VINYL ACETATE 7U BROMODICHLOROMETHANE	70 70 70 70 70 70	DIBROMOCHLOROMETHANE 1,1,2-TRICHLOROETHANE BENZENE TRANS-1,3-DICHLOROPROPENE BROMOFORM METHYL ISOBUTYL KETONE METHYL BUTYL KETONE TETRACHLOROETHENE(TETRACHLOROETH 1,1,2,2-TETRACHLOROETHANE TOLUENE CHLOROBENZENE ETHYL BENZENE STYRENE TOTAL XYLENES	

REMARKS

REMARKS

FOOTNOTES *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

01/04/91

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..

MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT

SAMPLE NO. 51645 SAMPLE TYPE: PROG ELEM: NSF COLLECTED BY: M GORDON PROJECT NO. 91-025 **

SOURCE:

CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1630 STOP: 00/00/00 D. NO.: Y166 MD NO: Y166 STATION ID: SD-04 CASE . NO . : 15099 SAS NO.: D. NO.: Y166

.. .. * * **

ANALYTICAL RESULTS UG/KG

2000J 1 UNIDENTIFIED COMPOUND

FOOTNOTES

**

^{*}A-ACTUAL VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
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01/04/91

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PESTICIDES/PCB'S DATA REPORT
. ...
                                                          PROG ELEM: NSF COLLECTED BY: M GORDON
                      SAMPLE NO. 51645 SAMPLE TYPE:
   PROJECT NO. 91-025
                                                                                                            **
                                                                                 ST: FL
    SOURCE:
                                                          CITY: PALMETTO
..
                                                                                                            ..
    STATION ID: SD-04
                                                          COLLECTION START: 10/17/90 1630 STOP: 00/00/00
..
                                                                                                            ..
   CASE NUMBER: 15099
                           SAS NUMBER:
                                                           D. NUMBER: Y166
.
                                                                                                            ..
..
                                                                                                            ..
   UG/KG
                   ANALYTICAL RESULTS
                                                          UG/KG
                                                                           ANALYTICAL RESULTS
    20U ALPHA-BHC
                                                          200U
                                                               METHOXYCHLOR
    20U
       BETA-BHC
                                                           40U
                                                               ENDRIN KETONE
       DELTA-BHC
                                                               CHLORDANE (TECH. MIXTURE) /1
    20U
                                                               GAMMA-CHLORDANE
    20U
       GAMMA-BHC (LINDANE)
                                                          200U
       HEPTACHLOR
                                                               ALPHA-CHLORDANE
    20U
                                                          200U
    20U
       ALDRIN
                                                          400U
                                                               TOXAPHENE
                                                               PCB-1016 (AROCLOR 1016)
PCB-1221 (AROCLOR 1221)
       HEPTACHLOR EPOXIDE
    200
                                                          200U
       ENDOSULFAN I (ALPHA)
    20U
                                                          200U
                                                               PCB-1232 (AROCLOR 1232)
    40U
       DIELDRIN
                                                          200U
       4.4'-DDE (P.P'-DDE)
ENDRIN
    40U
                                                          200U
                                                               PCB-1242 (AROCLOR 1242)
    40U
                                                          200U
                                                               PCB-1248 (AROCLOR 1248)
                                                          400U PCB-1254 (AROCLOR 1254)
400U PCB 1260 (AROCLOR 1260)
    40U
       ENDOSULFAN II (BETA)
       4.4' DDD (P.P' DDD)
    40U
    400 ENDOSULFAN SULFATE
                                                            19 PERCENT MOISTURE
    40U
       4.4'-DDT (P.P'-DDT)
```

REMARKS

REMARKS

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*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN

^{*}U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

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*C-CONFIRMED BY GCMS

1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

```
EXTRACTABLE ORGANICS DATA REPORT
PROG ELEM: NSF COLLECTED BY: M GORDON
     PROJECT NO. 91-025 SAMPLE NO. 51645 SAMPLE TYPE:
. .
                                                                        CITY: PALMETTO ST: FL
COLLECTION START: 10/17/90 1630 STOP: 00/00/00
. .
     SOURCE:
                                                                                                                                      **
     STATION ID: SD-04
..
                                                                                                                                     . .
                                                                                                                                     ..
  CASE NO.: 15099
                                                SAS NO.:
                                                                         D. NO.: Y166
                                                                                                                                      ..
ANALYTICAL RESULTS
    UG/KG
                                                                       UG/KG
                                                                                            ANALYTICAL RESULTS
                                                                      4000UR 3-NITROANILINE
810UR ACENAPHTHENE
4000U 2,4-DINITROPHENOL
    810U PHENOL
    810U BIS(2-CHLOROETHYL) ETHER
810U 2-CHLOROPHENOL
    810U 1.3-DICHLOROBENZENE
                                                                       4000U 4-NITROPHENOL
    8100 1,4-DICHLOROBENZENE
                                                                        810U DIBENZOFURAN
    810U BENZYL ALCOHOL
                                                                        810U 2,4-DINITROTOLUENE
    810U 1.2-DICHLOROBENZENE
                                                                        8100 DIETHYL PHTHALATE
                                                                        810U 4-CHLOROPHENYL PHENYL ETHER
    810U 2-METHYLPHENOL
                                                                       810U FLUORENE
4000U 4-NITROANILINE
4000U 2-METHYL-4,6-DINITROPHENOL
810U N-NITROSODIPHENYLAMINE/DIPHENYLAMINE
  810UR BIS(2-CHLOROISOPROPYL) ETHER
810U (3-AND/OR 4-)METHYLPHENOL
810U N-NITROSODI-N-PROPYLAMINE
    810U HEXACHLOROETHANE
   810UR NITROBENZENE
                                                                        810U 4 BROMOPHENYL PHENYL ETHER
   810U ISOPHORONE
                                                                        810U HEXACHLOROBENZENE (HCB)
   810U 2-NITROPHENOL
                                                                       4000U PENTACHLOROPHENOL
   810U 2,4-DIMETHYLPHENOL
                                                                        810U PHENANTHRENE
   4000U BÉNZOIC ACID
                                                                        810U ANTHRACENE
  810U BIS(2-CHLOROETHOXY) METHANE
810U 2.4-DICHLOROPHENOL
810UR 1.2.4-TRICHLOROBENZENE
                                                                        810U DI-N-BUTYLPHTHALATE
                                                                        810U FLUORANTHENE
                                                                        810U PYRENE
   810U NAPHTHALENE
                                                                        810U BENZYL BUTYL PHTHALATE
                                                                       1600U 3.3'-DICHLOROBENZIDINE
810U BENZO(A)ANTHRACENE
    810U 4-CHLOROANILINE
    810U HEXACHLOROBUTADIENE
    810U 4-CHLORO-3-METHYLPHENOL
                                                                        810U CHRYSENE
    810U 2-METHYLNAPHTHALENE
                                                                        810U BIS(2-ETHYLHEXYL) PHTHALATE
   810U HEXACHLOROCYCLOPENTADIENE (HCCP)
                                                                        810U DI-N-OCTYLPHTHALATE
  810U 2.4.6-TRICHLOROPHENOL
4000U 2.4.5-TRICHLOROPHENOL
810UR 2-CHLORONAPHTHALENE
                                                                        810U BENZO(B AND/OR K)FLUORANTHENE
                                                                        810U BENZO-A PYRENE
                                                                        810U INDENO (1.2,3-CD) PYRENE
810U DIBENZO(A,H)ANTHRACENE
   4000U 2-NITROANILINE
   8100 DIMETHYL PHTHALATE
                                                                        810U BENZO(GHI)PERYLENE
    810U ACENAPHTHYLENE
                                                                          19 PERCENT MOISTURE
   810U 2.6-DINITROTOLUENE
```

REMARKS

REMARKS

^{*}NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *A~AVERAGE VALUE *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

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EXTRACTABLE ORGANICS DATA REPORT
PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL
    PROJECT NO. 91-025 SAMPLE NO. 51655 SAMPLE TYPE: SOIL
     SOURCE: AMAX PHOSPHATE FACIL
..
                                                                     COLLECTION START: 10/17/90 1445 STOP: 00/00/00
* *
    STATION ID: SD-06
                                                                                                                               . .
                                                                                                                               * *
                                              SAS NO :
   CASE NO.: 15099
                                                                     D NO.: Y156
UG/KG
                  ANALYTICAL RESULTS
                                                                                       ANALYTICAL RESULTS
   800U PHENOL
800U BIS(2-CHLOROETHYL) ETHER
800U 2-CHLOROPHENOL
                                                                   3900UR 3-NITROANILINE
800UR ACENAPHTHENE
                                                                    3900U 2.4-DINITROPHENOL
   800U 1.3-DICHLOROBENZENE
                                                                    3900U 4-NITROPHENOL
   800U 1.4-DICHLOROBENZENE
                                                                     800U DIBENZOFURAN
   800U BÉNZYL ALCOHOL
                                                                     800U 2.4-DINITROTOLUENE
  800U 1.2-DICHLOROBENZENE
800U 2-METHYLPHENOL
800UR BIS(2-CHLOROISOPROPYL) ETHER
                                                                     800U DIETHYL PHTHALATE
                                                                           4-CHLOROPHENYL PHENYL ETHER
                                                                     800U
                                                                     800U
                                                                           FLUORENE
                                                                    39000
   800U (3-AND/OR 4-)METHYLPHENOL
                                                                           4-NITROANILINE
   800U N-NITROSODI-N-PROPYLAMINE
800U HEXACHLOROETHANE
                                                                    3900U
                                                                          2-METHYL-4,6-DINITROPHENOL
                                                                     800U N-NITROSODIPHENYLAMINE/DIPHENYLAMINE
  BOOUR NITROBENZENE
                                                                     800U 4 BROMOPHENYL PHENYL ETHER
   800U ISOPHORONE
                                                                     800U HEXACHLOROBENZENE (HCB)
   800U 2-NITROPHENOL
                                                                    3900U PENTACHLOROPHENOL
   800U 2,4-DIMETHYLPHENOL
                                                                     800U PHENANTHRENE
  3900U BENZOIC ACID
                                                                     BOOU ANTHRACENE
   800U BIS(2-CHLOROETHOXY) METHANE
800U 2.4-DICHLOROPHENOL
300UR 1.2.4-TRICHLOROBENZENE
                                                                     800U
                                                                           DI-N-BUTYLPHTHALATE
                                                                     800U
                                                                           FLUORANTHENE
                                                                     800U
800U
                                                                           PYRENE
  800UR
   BOOU NAPHTHALENE
                                                                           BENZYL BUTYL PHTHALATE
   800U 4-CHLOROANILINE
                                                                    1600U
                                                                           3,3'-DICHLOROBENZIDINE
                                                                           BENZO(A)ANTHRACENE
   800U HEXACHLOROBUTADIENE
                                                                     800U
   800U 4-CHLORO-3-METHYLPHENOL
                                                                     800U
                                                                          CHRYSENÉ
   800U 2-METHYLNAPHTHALENE
                                                                     800U BIS(2-ETHYLHEXYL) PHTHALATE
   800U HEXACHLOROCYCLOPENTADIENE (HCCP)
800U 2.4.6-TRICHLOROPHENOL
3900U 2.4.5-TRICHLOROPHENOL
                                                                     800U
                                                                           DI-N-OCTYLPHTHALATE
                                                                           BENZO(B AND/OR K)FLUORANTHENE
BENZO-A-PYRENE
                                                                     800U
   3900U
                                                                     800U
                                                                     800U INDENO (1,2,3-CD) PYRENE
800U DIBENZO(A,H)ANTHRACENE
  800UR
         2-CHLORONAPHTHALENE
   3900U 2-NITROANILINE
   800U DIMETHYL PHTHALATE
                                                                     800U BENZO(GHI)PERYLENE
   800U ACENAPHTHYLENE
                                                                       18 PERCENT MOISTURE
   800U 2.6-DINITROTOLUENE
```

REMARKS

REMARKS

^{*}Ă-ĂVĒRĂĞE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
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01/04/91

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MISCELLANEOUS PURGEABLE ORGANICS - DATA REPORT

SAMPLE NO. 51653 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON PROJECT NO. 91-025

SOURCE: AMAX PHOSPHATE FACIL

**

.

STATION ID: SD-07 CASE . NO .: 15099 SAS NO : CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1520 STOP: 00/00/00

D. NO.: Y160 MD NO: Y160

ANALYTICAL RESULTS UG/KG

20J 1 UNIDENTIFIED COMPOUND **30JN** TRIMETHYLBICYCLOHEPTANE 200JN METHYL (METHYLETHYL) BENZENE

^{*}NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *A-AVERAGE VALUE

^{*}K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
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PURGEABLE ORGANICS DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51655 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON .. SOURCE: AMAX PHOSPHATE FACIL .. CITY: PALMETTO ST: FL STATION ID: SD-06 COLLECTION START: 10/17/90 1445 STOP: 00/00/00 * * SAS NO.: CASE NO.: 15099 D. NO.: Y156 * * . UG/KG **ANALYTICAL RESULTS** UG/KG **ANALYTICAL RESULTS** 12U CHLOROMETHANE 6U 1.2-DICHLOROPROPANE 12U BROMOMETHANE 6U CIS-1,3-DICHLOROPROPENE 120 VINYL CHLORIDE 6U TRICHLOROETHENE (TRICHLOROETHYLENE) 12U CHLOROETHANE 6U DIBROMOCHLOROMETHANE METHYLENE CHLORIDE 1.1.2-TRICHLOROETHANE BENZENE 6U 6U ACETONE 26 6U CARBON DISULFIDE **6**U 6U TRANS-1.3-DICHLOROPROPENE 1,1-DICHLOROETHENE(1,1-DICHLOROETHYLENE) BROMOFORM 6U 6U 1.1-DICHLOROETHANE 12U METHYL ISOBUTYL KETONE 6U 1.2-DICHLOROETHENE (TOTAL) 12U METHYL BUTYL KETONE 6U CHLOROFORM 6U TETRACHLOROETHENE (TETRACHLOROETHYLENE) 6U 1.2-DICHLOROETHANE 12U METHYL ETHYL KETONE 6U 1,1,2,2-TETRACHLOROETHANE **6U TOLUENE** 6U 1.1.1-TRICHLOROETHANE **6U CHLOROBENZENE** 6U CARBON TETRACHLORIDE 6U ETHYL BENZENE VINYL ACETATE STYRENE 12U 6U 6U **BROMODICHLOROMETHANE** TOTAL XYLENES 6U PERCENT MOISTURE

REMARKS

REMARKS

FOOTNOTES

*A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

PESTICIDES/PCB'S DATA REPORT ** PROJECT NO. 91-025 SAMPLE NO. 51655 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M_GORDON PROG ELEM: NSF COLLECTED BY: M GORDON ST: FL * * .. SOURCE: AMAX PHOSPHATE FACIL . COLLECTION START: 10/17/90 1445 STOP: 00/00/00 STATION ID: SD-06 . . SAS NUMBER: CASE NUMBER: 15099 D. NUMBER: Y156 . . . ANALYTICAL RESULTS UG/KG **ANALYTICAL RESULTS** UG/KG 20U ALPHA-BHC 200U METHOXYCHLOR 20U BETA-BHC 39U ENDRIN KETONE 200 DELTA-BHC CHLORDANE (TECH. MIXTURE) /1 20U GAMMA-BHC (LINDANE) 200U GAMMA-CHLORDANE /2 20U HEPTACHLOR ALPHA-CHLORDANE 200U 20U ALDRIN 390U TOXAPHENE PCB-1016 (AROCLOR 1016) 20U HEPTACHLOR EPOXIDE 200U 20U ENDOSULFAN I (ALPHA) 200U PCB-1221 (AROCLOR 1221) PCB-1232 (AROCLOR 1232) PCB-1242 (AROCLOR 1242) DIELDRIN 39U 200U 39U 4,4'-DDE (P.P'-DDE) 200U 390 ENDRIN 200U PCB-1248 (AROCLOR 1248) 39U ENDOSULFAN II (BETA) 390U PCB-1254 (AROCLOR 1254) 39U 4.4'-DDD (P.P'-DDD) 390U PCB 1260 (AROCLOR 1260) 39U ENDOSULFAN SULFATE PERCENT MOISTURE 39U 4.4'-DDT (P.P'-DDT)

REMARKS

REMARKS

^{*}NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *A-AVERAGE VALUE *NA-NOT ANALYZED

^{*}K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION. 1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS. *C-CONFIRMED BY GCMS

PESTICIDES/PCB'S DATA REPORT *** * * * * * * * * * * * PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL PROJECT NO. 91-025 SAMPLE NO. 51653 SAMPLE TYPE: SOIL SOURCE: AMAX PHOSPHATE FACIL .. COLLECTION START: 10/17/90 1520 STOP: 00/00/00 D. NUMBER: Y160 .. STATION ID: SD-07 .. CASE NUMBER: 15099 SAS NUMBER: UG/KG ANALYTICAL RESULTS UG/KG ANALYTICAL RESULTS 21U ALPHA-BHC 210U METHOXYCHLOR 21U BETA-BHC 43U ENDRIN KETONE 21U DELTA-BHC CHLORDANE (TECH. MIXTURE) /1 21U GAMMA-BHC (LINDANE) 210U GAMMA-CHLORDANE /2 400 HEPTACHLOR 2100 ALPHA-CHLORDANE 21U ALDRIN 430U TOXAPHENE 21U HEPTACHLOR EPOXIDE 2100 PCB-1016 (AROCLOR 1016) PCB-1221 (AROCLOR 1221) PCB-1232 (AROCLOR 1232) PCB-1242 (AROCLOR 1242) PCB-1248 (AROCLOR 1248) 21U ENDOSULFAN I (ALPHA) 2100 2100 43U DIELDRIN 43U 4,4'-DDE (P.P'-DDE) 2100 43U ENDRIN 210U 43U ENDOSULFAN II (BETA) 430U PCB-1254 (AROCLOR 1254) 43U 4.4' DDD (P,P' DDD) 430U PCB 1260 (AROCLOR 1260) 43U ENDOSULFAN SULFATE 25 PERCENT MOISTURE 43U 4,4'-DDT (P,P'-DDT)

REMARKS

FOOTNOTES

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN

*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

*C-CONFIRMED BY GCMS

1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

01/04/91

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MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT

PROJECT NO. 91-025 SAMPLE NO. 51653 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON

SOURCE: AMAX PHOSPHATE FACIL

CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1520 STOP: 00/00/00

STATION ID: SD-07 SAS NO.: CASE NO .: 15099

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D. NO.: Y160

MD NO: Y160

ANALYTICAL RESULTS UG/KG

PETROLEUM PRODUCT 2000JN TETRAHYDROD INETHYL (METHYLETHYL) NAPHTHALENE DECAHYDROME THYLME THYLENE (ME THYLE THYL) - NAPHTHALENOL 1000JN

HEXADECANOIC ACID 500JN 300JN BENZOFLUORENE

20000J 5 UNIDENTIFIED COMPOUNDS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
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01/04/91

EXTRACTABLE ORGANICS DATA REPORT	ESD, ATTENS, CA.	01/04/91
PROJECT NO. 91-025 SAMPLE NO. 51653 SAMPLE TYPE: SOIL SOURCE: AMAX PHOSPHATE FACIL STATION ID: SD-07	PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1520 STOP: 00	/00/00
CASE NO.: 15099 SAS NO.: UG/KG ANALYTICAL RESULTS	D. NO.: Y160 UG/KG ANALYTICAL RESULTS	* * * * * * * * ***
B8OU PHENOL B8OU BIS(2-CHLOROETHYL) ETHER B8OU 2-CHLOROPHENOL B8OU 1,3-DICHLOROBENZENE B8OU 1,4-DICHLOROBENZENE B8OU 1,4-DICHLOROBENZENE B8OU 1,2-DICHLOROBENZENE B8OU 2-METHYL PHENOL B8OUR BIS(2-CHLOROISOPROPYL) ETHER B8OU 2-METHYL PHENOL B8OUR N-NITROSODI-N-PROPYLAMINE B8OU N-NITROSODI-N-PROPYLAMINE B8OU N-NITROSODI-N-PROPYLAMINE B8OU SOPHORONE B8OU 2-NITROPHENOL B8OU 2-NITROPHENOL B8OU 2-NITROPHENOL B8OU 2-OIMETHYLPHENOL B8OU BIS(2-CHLOROETHOXY) METHANE B8OU 2-4-DICHLOROPHENOL B8OU A-CHLORO-3-METHYLPHENOL B8OU A-CHLORO-3-METHYLPHENOL B8OU 2-METHYLNAPHTHALENE B8OU A-CHLORO-3-METHYLPHENOL B8OU 2-METHYLNAPHTHALENE B8OU 2-CHLOROPHENOL B8OU 2-CHLOROPHENOL B8OU 2-CHLOROPHENOL B8OU 2-METHYLNAPHTHALENE B8OU 2-CHLOROPHENOL B8OUR 2-CHLOROPHENOL B8OUR 2-CHLOROPHENOL B8OUR 2-CHLOROPHENOL B8OUR 2-CHLOROPHENOL B8OUR 2-CHLOROPHENOL B8OUR 2-CHLOROPHENOL B8OUR 2-CHLOROPHENOL B8OUR 2-CHLORONAPHTHALENE B8OU DIMETHYL PHTHALATE B8OU ACENAPHTHYLENE B8OU ACENAPHTHYLENE	4300UR 3-NITROANILINE 140J ACENAPHTHENE 4300U 2,4-DINITROPHENOL 4300U 4-NITROPHENOL 880U DIBENZOFURAN 880U 2,4-DINITROTOLUENE 880U DIETHYL PHTHALATE 880U 4-CHLOROPHENYL PHENYL ETHER 880U 4-NITROANILINE 4300U 2-METHYL-4,6-DINITROPHENOL 880U N-NITROSODIPHENYLAMINE/DIPHENYLAMINE 880U 4 BROMOPHENYL PHENYL ETHER 880U HEXACHLOROBENZENE (HCB) 4300U PENTACHLOROPHENOL 760J PHENANTHRENE 190J ANTHRACENE 880U DI-N-BUTYLPHTHALATE 3200 FLUORANTHENE 190J SENZYL BUTYL PHTHALATE 3200 FLUORANTHENE 1800U 3,3'-DICHLOROBENZIDINE 490J BENZYL BUTYL PHTHALATE 880U BENZYL BUTYL PHTHALATE 1800U 3,3'-DICHLOROBENZIDINE 490J BENZO(A)ANTHRACENE 710J CHRYSENE 880U BIS(2-ETHYLHEXYL) PHTHALATE 880U DI-N-OCTYLPHTHALATE 470J BENZO(B AND/OR K)FLUORANTHENE 140J INDENO (1,2,3-CD) PYRENE 880U BENZO-A-PYRENE 140J INDENO (1,2,3-CD) PYRENE 880U BENZO(GHI)PERYLENE 25 PERCENT MOISTURE	

REMARKS

REMARKS

^{*}TOUINGLEST"*

*A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

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01/04/91

PURGEA	BLE	ORGANICS DATA	REPORT		·				21,21,21
** S	OURC	CT NO. 91-025 E: AMAX PHOSPI ON ID: SD-07	SAMPLE NO. 51653 MATE FACIL	SAMPLE TYPE: SOIL	. PROG CITY:	ELEM: NSF (PALMETTO CTION START:	COLLECTED BY: M ST: 10/17/90 1520	FL	00
** C	ASE	NO.: 15099		SAS NO.:	D. N	O.: Y160			**
UG	* * /KG		ANALYTICAL RESULTS	• • • • • • • •	UG/KG	* * * * * *	ANALYTICAL RE	* * * * * * * * SULTS	
1 1 3 1	30 30 30 70 70 70 70 70 70 70 70 30 70 30	CHLOROMETHANE BROMOMETHANE VINYL CHLORIDE CHLOROETHANE METHYLENE CHLO ACETONE CARBON DISULF! 1,1-DICHLOROE! 1,2-DICHLOROE! 1,2-DICHLOROE! METHYL ETHYL K 1,1-TRICHLOR CARBON TETRACH VINYL ACETATE BROMODICHLOROM	ORIDE DE HENE(1,1-DICHLOROETI HANE HENE (TOTAL) HANE ETONE ROETHANE HLORIDE	HYLENE)	7U 7U 7U 7U 7U 7U 13U 13U 7U 7U 7U 7U 7U 7U	DIBROMOCHLOI 1.1.2-TRICHI BENZENE TRANS-1.3-D BROMOFORM METHYL ISOBI METHYL BUTYI TETRACHLOROI	HLOROPROPENE HENE (TRICHLOROE: HENE (TRICHLOROE: ROMETHANE LOROETHANE ICHLOROPROPENE UTYL KETONE L KETONE ETHENE (TETRACHLOROETHANE NE NE NE ES		

REMARKS

REMARKS

FOOTNOTES *COTNOTES***

*A-ACTUAL VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

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SAMPLE AND ANALYSIS MANAGEMENT SYSTEM

EPA-REGION IV ESD, ATHENS, GA. 01/04/91

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PESTICIDES/PCB'S DATA REPORT
PROJECT NO. 91-025 SAMPLE NO. 51648 SAMPLE TYPE: SOIL
                                                           PROG ELEM: NSF COLLECTED BY: M GORDON
                                                                                                              . .
    SOURCE: AMAX PHOSPHATE FACIL
STATION ID: SD-08
                                                                                   ST: FL
                                                            CITY: PALMETTO
. .
                                                                                                              ..
                                                            COLLECTION START: 10/17/90 1610 STOP: 00/00/00
**
                                                                                                              ..
                                                            D. NUMBER: Y164
    CASE NUMBER: 15099
                            SAS NUMBER:
* *
                                                                                                              * *
..
                                                                                                              * *
UG/KG
                    ANALYTICAL RESULTS
                                                            UG/KG
                                                                             ANALYTICAL RESULTS
    24U ALPHA-BHC
                                                            240U METHOXYCHLOR
    24U BETA-BHC
                                                            47U
                                                                 ENDRIN KETONE
                                                                 CHLORDANE (TECH. MIXTURE) /1
    240
        DELTA-BHC
    24Ú
        GAMMA-BHC (LINDANE)
HEPTACHLOR
                                                            240U
                                                                 GAMMA-CHLORDANE
                                                                                /2
                                                                 ALPHA-CHLORDANE
    40U
                                                            240U
    24U
        ALDRIN
                                                            470U
                                                                 TOXAPHENE
        HEPTACHLOR EPOXIDE
    24U
                                                            240U
                                                                PCB-1016 (AROCLOR 1016)
        ENDOSULFAN I (ALPHA)
                                                            240U
                                                                PCB-1221 (AROCLOR 1221)
    240
        DIELDRIN
                                                                PCB-1232 (AROCLOR 1232)
    47U
                                                            240U
        4,4'-DDE (P,P'-DDE)
                                                            240U
                                                                PCB-1242 (AROCLOR 1242)
    47U
                                                                PCB-1248 (AROCLOR 1248)
    47U ENDRIN
                                                            350
                                                           470U PCB-1254 (AROCLOR 1254)
470U PCB-1260 (AROCLOR 1260)
    47Ú
        ENDOSULFAN II (BETA)
4.4' DDD (P.P' DDD)
    47U
        ENDOSULFAN SULFATE
    47U
                                                             32
                                                                PERCENT MOISTURE
        4.4'-DDT (P.P'-DDT)
    47U
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REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT. *R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

^{*}C-CONFIRMED BY GCMS 1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

01/04/91

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MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT

PROJECT NO. 91-025 SAMPLE NO. 51648 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON

CITY: PALMETTO ST: FL SOURCE: AMAX PHOSPHATE FACIL

STATION ID: SD-08 CASE.NO.: 15099 COLLECTION START: 10/17/90 1610 STOP: 00/00/00 MD NO: Y164 SAS NO.: D. NO.: Y164

ANALYTICAL RESULTS UG/KG

500JN TETRAHYDRODIMETHYL (METHYLETHYL) NAPHTHALENE 7 UNIDENTIFIED COMPOUNDS 20000J

FOOTNOTES

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^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
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01/04/91 EXTRACTABLE ORGANICS DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51648 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1610 STOP: 00/00/00 SOURCE: AMAX PHOSPHATE FACIL STATION ID: SD-08 . . * * . . SAS NO.: ** CASE NO.: 15099 D. NO.: Y164 . . ANALYTICAL RESULTS UG/KG ANALYTICAL RESULTS 4700UR 3-NITROANILINE 970UR ACENAPHTHENE 4700U 2,4-DINITROPHENOL 4700U 4-NITROPHENOL 970U PHENOL 970U BIS(2-CHLOROETHYL) ETHER 970U 2-CHLOROPHENOL 970U 1,3-DICHLOROBENZENE 970U DIBENZOFURAN 970U 1.4-DICHLOROBENZENE 970U BENZYL ALCOHOL 970U 2.4-DINITROTOLUENE 970U 1.2-DICHLOROBENZENE 970U DIETHYL PHTHALATE 970U 4-CHLOROPHENYL PHENYL ETHER 970U 2-METHYLPHENOL 970UR BIS(2-CHLOROISOPROPYL) ETHER 970U (3-AND/OR 4-)METHYLPHENOL 970U N-NITROSODI-N-PROPYLAMINE 970U FLUORENE
4700U 4-NITROANILINE
4700U 2-METHYL-4.6-DINITROPHENOL
970U N-NITROSODIPHENYLAMINE/DIPHENYLAMINE 970U HEXACHLOROETHANE 970UR NITROBENZENE 970U 4-BROMOPHENYL PHENYL ETHER 970U ISOPHORONE 970U HEXACHLOROBENZENE (HCB) 970U 2-NITROPHENOL 4700U PENTACHLOROPHENOL 970U 2,4-DIMETHYLPHENOL 970U PHENANTHRENE 4700U BENZOIC ACID 970U ANTHRACENE 970U BIS(2-CHLOROETHOXY) METHANE 970U 2,4-DICHLOROPHENOL 970UR 1,2,4-TRICHLOROBENZENE 970U DI-N-BUTYLPHTHALATE 9700 FLUORANTHENE 9700 PYRENE 970U NAPHTHALENE 210J BENZYL BUTYL PHTHALATE 1900U 3.3'-DICHLOROBENZIDINE 970U BENZO(A)ANTHRACENE 970U 4-CHLOROANILINE 970U HEXACHLOROBUTADIENE 970U 4-CHLORO-3-METHYLPHENOL 970U CHRYSENÉ 970U BIS(2-ETHYLHEXYL) PHTHALATE 970U 2-METHYLNAPHTHALENE 970U HEXACHLOROCYCLOPENTADIENE (HCCP) 970U DI-N-OCTYLPHTHALATE 970U 2.4.6-TRICHLOROPHENOL 4700U 2.4.5-TRICHLOROPHENOL 970UR 2-CHLORONAPHTHALENE 970U BENZO(B AND/OR K)FLUORANTHENE 970U BENZO-A-PYRENE 970U INDENO (1.2.3-CD) PYRENE 970U DIBENZO(A.H)ANTHRACENE 4700U 2-NITROANILINE 970U DIMETHYL PHTHALATE 970U BENZO(GHI)PERYLENE 970U ACENAPHTHYLENE 32 PERCENT MOISTURE

REMARKS

970U 2.6-DINITROTOLUENE

REMARKS

F001N01ES

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

^{*}P-QC INDICATES THAT DATA UNUSABLE, COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

01/04/91

PURGEABLE	ORGANICS DATA	REPORT		A REGION IV E.	<i>.</i> Ac					01/04/31
*** PROJE	CT NO. 91-025 E: AMAX PHOSPH ON ID: SD-08	SAMPLE NO.	51648 SAMPLE TY	PE: SOIL	CITY:	ELEM: NSF PALMETTO CTION START:		BY: M GORDON ST: FL 1610 STOP:	00/00/00	* * * ***
	NO.: 15099		SAS NO.	:	D. N	O.: Y164				**
UG/KG		ANALYTICAL RES	SULTS		UG/KG	* * * * * *	ANALYTICA	AL RESULTS	* * * * *	* * * ***
150 150 150 70 150 70 70 70 70 150 70 150	CHLOROMETHANE BROMOMETHANE VINYL CHLORIDE CHLOROETHANE METHYLENE CHLOR ACETONE CARBON DISULFI 1,1-DICHLOROEI 1,2-DICHLOROEI 1,2-DICHLOROEI CHLOROFORM 1,2-DICHLOROEI CHLOROFORM 1,2-DICHLOROEI METIIYL ETHYL METIYL VINYL ACETATE BROMODICHLOROM	PRIDE DE HENE(1,1-DICHU HANE HENE (TOTAL) HANE ETONE OETHANE LORIDE	LOROETHYLENE)		7U 7U 7U 7U 7U 7U 15U 15U 7U 7U 7U 7U 7U 7U	TRICHLORDET DIBROMOCHLO 1,1,2-TRICH BENZENE TRANS-1,3-E BROMOFORM METHYL ISOE METHYL BUTY TETRACHLORO	CHLOROPROPE) HENE (TRICHIO) HENE (TRICHIO) HENE (TRICHIO) HENE (TRICHIO) HENE (TENE HENE (TENE HENE (TENE HENE (TENE HENE HENE HENE HENE HES	OROETHYLENE) PENE RACHLOROETHYLE	NE)	

REMARKS

REMARKS

FOOTNOTES *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
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*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

01/04/91

PESTICIDES/PCB'S DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51652 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO ST: FL .. ** COLLECTION START: 10/17/90 1530 STOP: 00/00/00 STATION ID: SD-09 * * CASE NUMBER: 15099 SAS NUMBER: D. NUMBER: Y162 .. ** . . ** ANALYTICAL RESULTS UG/KG UG/KG **ANALYTICAL RESULTS** 27U ALPHA-BHC 270U METHOXYCHLOR 27U BETA-BHC 53U ENDRIN KETONE CHLORDANE (TECH. MIXTURE) /1 27U DELTA-BHC 27U GAMMA-BHC (LINDANE) GAMMA-CHLORDANE 50U HEPTACHLOR 270U ALPHA-CHLORDANE TOXAPHENE 27U ALDRIN 530U HEPTACHLOR EPOXIDE 270U PCB-1016 (AROCLOR 1016) PCB-1221 (AROCLOR 1221) 27U 270 ENDOSULFAN I (ALPHA) 27QU 53U DIELDRIN 2700 PCB-1232 (AROCLOR 1232) 53U 4.4'-DDE (P.P'-DDE) 270U PCB-1242 (AROCLOR 1242) 53U ENDRIN 270U PCB-1248 (AROCLOR 1248) 530 ENDOSULFAN II (BETA) PCB-1254 (AROCLOR 1254) 530U 5300 PCB 1260 (AROCLOR 1260) 530 4,4'-DDD (P.P'-DDD) 53U ENDOSULFAN SULFATE PERCENT MOISTURE 53U 4.4'-DDT (P.P'-DDT)

REMARKS

REMARKS

FOOTNOTES *A-AVERAGE VALUE ◆NA-NOT ANALYZED ◆NAI-INTERFERENCES ◆J-ESTIMATED VALUE ◆N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

^{*}K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
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01/04/91

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MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT

PROJECT NO. 91-025 SAMPLE NO. 51652 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON

SOURCE: AMAX PHOSPHATE FACIL STATION ID: SD-09 ..

CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1530 STOP: 00/00/00 MD NO: Y162

CASE NO : 15099 SAS NO.: D. NO.: Y162

ANALYTICAL RESULTS UG/KG

5000JF 1000JN

2 UNIDENTIFIED COMPOUNDS DODECANOIC ACID HEPTADECANOIC ACID OCTADECANOIC ACID 400JN: 800JN

FOOTNOTES

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^{*}NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *NA-NOT ANALYZED

^{*}K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MAIERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

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EXTRACTABLE ORGANICS DATA REPORT
PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL
     PROJECT NO. 91-025 SAMPLE NO. 51652 SAMPLE TYPE: SOIL
                                                                                                                                                   **
     SOURCE: AMAX PHOSPHATE FACIL
     STATION ID: SD-09
                                                                               COLLECTION START: 10/17/90 1530 STOP: 00/00/00
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                                                                                                                                                  .
                                                    SAS NO.:
** CASE NO.: 15099
                                                                               D. NO.: Y162
                                                                                                                                                   **
ANALYTICAL RESULTS
                                                                              UG/KG
                                                                                                    ANALYTICAL RESULTS
   1100U PHENOL
                                                                             5300UR 3-NITROANILINE
   1100U BIS(2-CHLOROETHYL) ETHER
1100U 2-CHLOROPHENOL
                                                                             3-NITRUANILINE
110UR ACENAPHTHENE
5300U 2.4-DINITROPHENOL
5300U 4-NITROPHENOL
1100U 01BENZOFURAN
1100U 2.4-DINITROTOLUENE
1100U 01ETHYL PHTHALATE
1100U 4-CHLOROPHENYL PHENYL ETHER
   1100U 1,3-DICHLOROBENZENE
   1100U 1.4-DICHLOROBENZENE
1100U BENZYL ALCOHOL
1100U 1.2-DICHLOROBENZENE
1100U 2-METHYLPHENOL
  1100UR BIS(2-CHLOROISOPROPYL) ETHER
                                                                              1100U FLUORENE
   1100U (3-AND/OR 4-)METHYLPHENOL
                                                                              5300U 4-NITROANILINE
5300U 2-METHYL-4.6-DINITROPHENOL
1100U N-NITROSODIPHENYLAMINE/DIPHENYLAMINE
   1100U N-NITROSODI-N-PROPYLAMINE
   1100U HEXACHLOROETHANE
  1100UR NITROBENZENE
                                                                              1100U 4 BROMOPHENYL PHENYL ETHER
   1100U ISOPHORONE
1100U 2-NITROPHENOL
1100U 2.4-DIMETHYLPHENOL
5300U BENZOIC ACID
                                                                              1100U HEXACHLOROBENZENE (HCB)
                                                                              5300U PENTACHLOROPHENOL
1100U PHENANTHRENE
                                                                              1100U ANTHRACENE
                                                                              11000 DI-N-BUTYLPHTHALATE
11000 FLUORANTHENE
   1100U BIS(2-CHLOROETHOXY) METHANE
   1100U 2,4-DICHLOROPHENOL
  1100UR 1,2,4-TRICHLOROBENZENE
                                                                              1100U PYRENE
   1100U NAPHTHALENE
                                                                              1100U BENZYL BUTYL PHTHALATE
   1100U 4-CHLOROANILINE
                                                                              2200U 3,3'-DICHLOROBENZIDINE
   1100U HEXACHLOROBUTADIENE
                                                                              1100U BENZO(A)ANTHRACENE
   1100U 4-CHLORO-3-METHYLPHENOL
1100U 2-METHYLNAPHTHALENE
1100U HEXACHLOROCYCLOPENTADIENE (HCCP)
                                                                              1100U CHRYSENE
1100U BIS(2-ETHYLHEXYL) PHTHALATE
1100U DI-N-OCTYLPHTHALATE
   1100U 2.4.6-TRICHLOROPHENOL
5300U 2.4.5-TRICHLOROPHENOL
                                                                              1100U BENZO(B AND/OR K)FLUORANTHENE
                                                                              1100U BENZO-A-PYRENE
  1100UR 2-CHLORONAPHTHALENE
                                                                              1100U TNDENO (1.2,3-CD) PYRENE
1100U DIBENZO(A,H)ANTHRACENE
   5300U 2-NITROANILINE
   1100U DIMETHYL PHTHALATE
                                                                              1100U BENZO(GHI)PERYLENE
   1100U ACENAPHTHYLENE
                                                                                 40 PERCENT MOISTURE
   1100U 2,6-DINITROTOLUENE
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REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM

EPA-REGION IV ESD, ATHENS, GA. 01/04/91

PROG ELEM: NSF COLLECTED BY: M GORDON PROJECT NO. 91-025 SAMPLE NO. 51652 SAMPLE TYPE: SOIL . . CITY: PALMETTO SOURCE: AMAX PHOSPHATE FACIL .. ST: FL .. COLLECTION START: 10/17/90 1530 STOP: 00/00/00 .. STATION ID: SD-09 .. ** * * SAS NO : D. NO.: Y162 CASE NO.: 15099 . .

ANALYTICAL RESULTS UG/KG UG/KG ANALYTICAL RESULTS 17U CHLOROMETHANE 8U 1.2-DICHLOROPROPANE 17U BROMOMETHANE CIS-1.3-DICHLOROPROPENE VINYL CHLORIDE TRICHLOROETHENE (TRICHLOROETHYLENE) 17U **CHLOROE THANE** DIBROMOCHLOROME THANE 170 METHYLENE CHLORIDE 1,1,2-TRICHLOROETHANE 90 8U 37 ACETONE 8U BENZENE CARBON DISULFIDE 80 TRANS-1.3-DICHLOROPROPENE 1,1-DICHLOROETHENE(1.1-DICHLOROETHYLENE) BROMOFORM 8U 80 1,1-DICHLOROETHANE METHYL ISOBUTYL KETONE 17U 1 2-DICHLOROETHENE (TOTAL) 17U METHYL BUTYL KETONE 80 CHLOROFORM TETRACHLOROETHENE (TETRACHLOROETHYLENE) 1,2-DICHLOROETHANE 8Ü 1,1,2,2-TETRACHLOROETHANE 80 MÉTHYL ETHYL KETONE 17U 8U TOLUENE 1,1,1-TRICHLOROETHANE 80 **CHLOROBENZENE** 80 CARBON TETRACHLORIDE 80 ETHYL BENZENE

REMARKS

17U

8U

PURGEABLE ORGANICS DATA REPORT

VINYL ACETATE

BROMODICHLOROMETHANE

REMARKS

8U

8U

STYRENE

TOTAL XYLENES

PERCENT MOISTURE

FOOTNOTES *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

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01/04/91 PESTICIDES/PCB'S DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51688 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO ST: FL .. STATION ID: SD-10 COLLECTION START: 10/17/90 1045 STOP: 00/00/00 . . CASE NUMBER: 15099 SAS NUMBER: D. NUMBER: Y150 ..

UG/KG ANALYTICAL RESULTS UG/KG **ANALYTICAL RESULTS** 300U METHOXYCHLOR 30U ALPHA-BHC 30U BETA-BHC 59U ENDRIN KETONE CHLORDANE (TECH. MIXTURE) /1 30U DELTA-BHC GAMMA-BHC (LINDANE) 3000 GAMMA-CHLORDANE 30U /2 300 HEPTACHLOR 3000 ALPHA-CHLORDANE

590U TOXAPHENE 30U ALDRIN PCB-1016 (AROCLOR 1016) PCB-1221 (AROCLOR 1221) PCB-1232 (AROCLOR 1232) PCB-1242 (AROCLOR 1242) PCB-1248 (AROCLOR 1248) 30U HEPTACHLOR EPOXIDE 300U ENDOSULFAN I (ALPHA) 30U 3000 59U DIELDRIN 3000 4.4'-DOE (P.P'-DDE) 590 3000 ENDRIN 59Ū 3000

59U ENDOSULFAN II (BETA) 590U PCB-1254 (AROCLOR 1254) 59U 4.4' DDD (P.P' DDD) 590U PCB 1260 (AROCLOR 1260) 590 ENDOSULFAN SULFATE PERCENT MOISTURE 59U 4.4'-DDT (P.P'-DDT)

REMARKS ***REMARKS***

FOOTNOTES *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN

*C-CONFIRMED BY GCMS 1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

^{*}U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT. *R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

01/04/91

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MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT

PROJECT NO. 91-025 SAMPLE NO. 51688 SAMPLE TYPE: SOIL SOURCE: AMAX PHOSPHATE FACIL

PROG ELEM: NSF COLLECTED BY: M GORDON

CITY: PALMETTO ST: FL

COLLECTION START: 10/17/90 1045 STOP: 00/00/00

STATION ID: SD-10 CASE NO.: 15099

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. . . . SAS NO.:

D. NO.: Y150

MD NO: Y150

ANALYTICAL RESULTS UG/KG

4 UNIDENTIFIED COMPOUNDS 30000J 30000JN 20000JN 700JN 20000JN PHENYLETHANONE DODECANOIC ACID TETRADECANOIC ACID HEXADECANOIC ACID 2000JN PHENYLTRICYCLONONADIENOL 6000JN DIPHENYLPROPANEDIONE 4000JN OCTADECANOIC ACID

^{*}NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

^{*}K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

01/04/91

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EXTRACTABLE ORGANICS DATA REPORT
** PROJECT NO. 91-025 SAMPLE NO. 51688 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON **

** SOURCE: AMAX PHOSPHATE FACIL

** PROJECT NO. 91-025 SAMPLE NO. 51688 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON **

** SOURCE: AMAX PHOSPHATE FACIL

**
     STATION ID: SD-10
                                                                           COLLECTION START: 10/17/90 1045 STOP: 00/00/00
                                                                                                                                           ..
. .
** CASE NO.: 15099
                                                  SAS NO.:
                                                                         D. NO.: Y150
UG/KG ANALYTICAL RESULTS
                                                                          UG/KG ANALYTICAL RESULTS
                                                                         5900UR 3-NITROANILINE
1200U ACENAPHTHENE
   10000 PHENOL
   1200U BIS(2-CHLOROETHYL) ETHER
1200U 2-CHLOROPHENOL
                                                                           5900U 2.4-DINITROPHENOL
   1200U 1,3-DICHLOROBENZENE
                                                                           5900U 4-NITROPHENOL
                                                                           1200U DIBENZOFURAN
   1200U 1.4-DICHLOROBENZENE
   1200U BENZYL ALCOHOL
                                                                           1200U 2,4-DINITROTOLUENE
   1200U 1.2-DICHLOROBENZENE
1200U 2-METHYLPHENOL
                                                                           1200U DIETHYL PHTHALATE
                                                                           1200U 4-CHLOROPHENYL PHENYL ETHER
                                                                           1200U FLUORENE
  1200UR BIS(2-CHLOROISOPROPYL) ETHER
   1200U (3-AND/OR 4-)METHYLPHENOL
1200U N-NITROSODI-N-PROPYLAMINE
                                                                           5900U 4-NITROANILINE
                                                                           5900U 2-METHYL-4.6-DINITROPHENOL
1200U N-NITROSODIPHENYLAMINEZDIPHENYLAMINE
   1200U HEXACHLOROETHANE
                                                                           1200U 4 BROMOPHENYL PHENYL ETHER
  1200UR NITROBENZENE
                                                                           1200U HEXACHLOROBENZENE (HCB)
   1200U ISOPHORONE
                                                                           5900U PENTACHLOROPHENOL
   1200U 2-NITROPHENOL
   1200U 2.4-DIMETHYLPHENOL
690J BENZOIC ACID
1200U BIS(2-CHLOROETHOXY) METHANE
                                                                           1200U PHENANTHRENE
                                                                           1200U ANTHRACENE
                                                                           12000
                                                                                  DI-N-BUTYLPHTHALATE
   12000
          2.4-DICHLOROPHENOL
                                                                           12000
                                                                                 FLUORANTHENE
          1,2,4-TRICHLOROBENZENE
                                                                           1200U PYRENE
  1200UR
   1200U NAPHTHALENE
                                                                           12000 BENZYL BUTYL PHTHALATE
   1200U 4-CHLOROANILINE
                                                                           2400U 3,3'-DICHLOROBENZIDINE
   1200U HEXACHLOROBUTADIENE
                                                                           1200U BÉNZO(A)ANTHRACENE
   1200U 4-CHLORO-3-METHYLPHENOL
                                                                           1200U CHRYSENÉ
   1200U 2-METHYLNAPHTHALENE
                                                                           1200U BIS(2-ETHYLHEXYL) PHTHALATE
                                                                           1200U DI-N-OCTYLPHTHALATE
1200U BENZO(B AND/OR K)FLUORANTHENE
   1200U HEXACHLOROCYCLOPENTADIENE (HCCP)
1200U 2.4.6-TRICHLOROPHENOL
   5900Ü
          2.4,5-TRICHLOROPHENOL
                                                                                  BENZO-A-PYRENE
                                                                           1200U
  1200UR
          2-CHLORONAPHTHALENE
                                                                           12000
                                                                                  INDENO (1,2,3-CD) PYRENE
   5900U
          2-NITROANILINE
                                                                           1200U DIBENZO(A, H)ANTHRACENE
   1200U DIMETHYL PHTHALATE
                                                                           1200U BENZO(GHI)PERYLENE
   1200U
          ACENAPHTHYLENE
                                                                                 PERCENT MOISTURE
   1200U 2,6-DINITROTOLUENE
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REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM

EPA-REGION IV ESD. ATHENS. GA. 01/04/91 PURGEABLE ORGANICS DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51688 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO ** ST: FL STATION ID: SD-10 COLLECTION START: 10/17/90 1045 STOP: 00/00/00 * * ** CASE NO.: 15099 SAS NO.: D. NO.: Y150 . . UG/KG ANALYTICAL RESULTS UG/KG **ANALYTICAL RESULTS** 19U CHLOROMETHANE 9U 1,2-DICHLOROPROPANE 19U BROMOMETHANE CIS-1.3-DICHLOROPROPENE 90 VINYL CHLORIDE TRICHLOROETHENE (TRICHLOROETHYLENE) 190 19U CHLOROETHANE DIBROMOCHLOROMETHANE 9U METHYLENE CHLORIDE 1.1.2-TRICHLOROETHANE 30U ACETONE 90 BENZENE CARBON DISULFIDE 90 TRANS-1, 3-DICHLOROPROPENE 1,1-DICHLOROETHENE(1,1-DICHLOROETHYLENE)
1,1-DICHLOROETHANE 911 9Ü BROMOFORM METHYL ISOBUTYL KETONE METHYL BUTYL KETONE 190 1.2-DICHLOROETHENE (TOTAL) 190

REMARKS

REMARKS

90

9Ü

9Ü

TOLUENE

STYRENE

CHLOROBENZENE

ETHYL BENZENE

TOTAL XYLENES PERCENT MOISTURE

TETRACHLOROETHENE (TETRACHLOROETHYLENE)

1,1,2,2-TETRACHLOROETHANE

FOO!NO!ES

CHLOROFORM

1,2-DICHLOROETHANE

1.1.1-TRICHLOROETHANE

CARBON TETRACHLORIDE

BROMODICHLOROME THANE

19U MÉTILYL ETHYL KETONE

VINYL ACETATE

90

90

9U

90

190

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT. *R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

01/04/91

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MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT

PROJECT NO. 91-025 SAMPLE NO. 51649 SAMPLE TYPE: SOIL

SOURCE: AMAX PHOSPHATE FACIL

STATION ID: SD-11 CASE NO : 15099 SAS NO.:

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PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL

COLLECTION START: 10/17/90 1505 STOP: 00/00/00 D. NO.: Y159 MD NO: Y159

ANALYTICAL RESULTS UG/KG

50000J 17 UNIDENTIFIED COMPOUNDS PETROLEUM PRODUCT

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE, COMPOUND MAY OR MAY NOT BE PRESENT, RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

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PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL PROJECT NO. 91-025 SAMPLE NO. 51672 SAMPLE TYPE: GROUNDWA

SOURCE: AMAX PHOSPHATE FACIL • •

COLLECTION START: 10/17/90 1145 STOP: 00/00/00 D. NO.: Y151 MD NO: Y151

STATION ID: TW-03 CASE.NO.: 15099 SAS NO.:

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RESULTS UNITS PARAMETER 10U UG/L CYANIDE

FOOTNOTES *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

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PROG ELEM: NSF COLLECTED BY: M GORDON PROJECT NO. 91-025 SAMPLE NO. 51662 SAMPLE TYPE: GROUNDWA

SOURCE: AMAX PHOSPHATE FACIL STATION ID: TW-04 CASE.NO.: 15099

CITY: PALMETTO ST: FL
COLLECTION START: 10/18/90 1040 STOP: 00/00/00
D. NO.: Y175 MD NO: Y175

SAS NO.: ** ** ** * *

> RESULTS UNITS PARAMETER 100 UG/L CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

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PROG ELEM: NSF COLLECTED BY: M GORDON PROJECT NO. 91-025 SAMPLE NO. 51664 SAMPLE TYPE: GROUNDWA ..

SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO ST: FL

COLLECTION START 10/18/90 0930 STOP: 00/00/00 D. NO.: Y172 MD NO: Y172 STATION ID: TW-05 CASE.NO.: 15099 SAS NO.:

> RESULTS UNITS PARAMETER 10U UG/L CYANIDE

FOOTNOTES *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD, ATHENS, GA.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

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PROJECT NO. 91-025 SAMPLE NO. 51673 SAMPLE TYPE: GROUNDWA PROG ELEM: NSF COLLECTED BY: M GORDON

SOURCE: AMAX PHOSPHATE FACIL STATION ID: MW-01 CITY: PALMETTO ST: FL COLLECTION START: 10/16/90 1130 STOP: 00/00/00 D. NO.: Y326 MD NO: Y326 SAS NO.:

** ** CASE NO .: 15099 ** **

> RESULTS UNITS PARAMETER 10UJ UG/L CYANIDE

REMARKS HOLDING TIME EXCEEDED-CN ***REMARKS***

^{***}FOOTNOTES*** *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD, ATHENS, GA.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

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PROJECT NO. 91-025 SAMPLE NO. 51687 SAMPLE TYPE: GROUNDWA PROG ELEM: NSF COLLECTED BY: M GORDON

SOURCE: AMAX PHOSPHATE FACIL STATION ID: MW-03 CASE.NO.: 15099 SAS CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 0900 STOP: 00/00/00 D. NO.: Y328 MD NO: Y328

** ** SAS NO.: ** **

> RESULTS UNITS PARAMETER TOUJ UG/L CYANIDE

REMARKS HOLDING TIME EXCEEDED-CN ***REMARKS***

^{***}FOOTNOTES*** *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD, ATHENS, GA.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

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PROJECT NO. 91-025 SAMPLE NO. 51679 SAMPLE TYPE: GROUNDWA PROG ELEM: NSF COLLECTED BY: M GORDON ..

SOURCE: AMAX PHOSPHATE FACIL STATION ID: MW-04

CITY: PALMETTO ST: FL COLLECTION START: 10/16/90 1520 STOP: 00/00/00 D. NO.: Y327 MD NO: Y327

** CASE . NO . : 15099 SAS NO.: **

> RESULTS UNITS PARAMETER 10UJ UG/L CYANIDE

REMARKS HOLDING TIME EXCEEDED-CN ***REMARKS***

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

01/04/91

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EXTRACTABLE ORGANICS DATA REPORT
PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL
    PROJECT NO. 91-025 SAMPLE NO. 51649 SAMPLE TYPE: SOIL
    SOURCE: AMAX PHOSPHATE FACIL
                                                                      COLLECTION START: 10/17/90 1505 STOP: 00/00/00
    STATION ID: SD-11
                                                                                                                                  ..
** CASE NO.: 15099
                                             SAS NO.:
                                                                      D. NO.: Y159
                                                                                                                                  . .
ANALYTICAL RESULTS
                                                                     UG/KG
   UG/KG
                                                                                         ANALYTICAL RESULTS
   1400U PHENOL
                                                                    6700UR 3-NITROANILINE
  1400U BIS(2-CHLOROETHYL) ETHER
1400U 2-CHLOROPHENOL
                                                                    1400UR ACENAPHTHENE
                                                                     6700U 2,4-DINITROPHENOL
   1400U 1,3-DICHLOROBENZENE
                                                                     6700U 4-NITROPHENOL
   1400U 1.4-DICHLOROBENZENE
                                                                     1400U DIBENZOFURAN
                                                                     1400U 2.4-DÎNÎTROTOLUENE
1400U DIETHYL PHTHALATE
1400U 4-CHLOROPHENYL PHENYL ETHER
  1400U BENZYL ALCOHOL
1400U 1,2-DICHLOROBENZENE
1400U 2-METHYLPHENOL
  1400Ŭ
         BIS(2-CHLOROISOPROPYL) ETHER
(3-AND/OR 4-)METHYLPHENOL
  1400UR
                                                                     1400U FLUORENE
   1400U
                                                                     6700U 4-NITROANILINE
 1400U N-NITROSODI-N-PROPYLAMINE
1400U HEXACHLOROETHANE
1400UR NITROBENZENE
                                                                     6700U 2-METHYL-4,6-DINITROPHENOL
1400U N-NITROSODIPHENYLAMINE/DIPHENYLAMINE
                                                                     1400U 4-BROMOPHENYL PHENYL ETHER
  1400U ISOPHORONE
                                                                     1400U HEXACHLOROBENZENE (HCB)
  1400U 2-NITROPHENOL
                                                                     6700U PENTACHLOROPHENOL
  1400U 2.4-DIMETHYLPHENOL
                                                                     1400U PHENANTHRENE
  6700U BENZOIC ACID
                                                                     1400U
                                                                            ANTHRACENE
                                                                            DI-N-BUTYLPHTHALATE FLUORANTHENE
                                                                      150J
  1400U
         BIS(2-CHLOROETHOXY) METHANE
  1400U
         2,4-DICHLOROPHENOL
                                                                     1400Ŭ
         1,2,4-TRICHLOROBENZENE
                                                                     14000
  1400UR
                                                                            PYRENE
  1400U NAPHTHALENE
                                                                     1400U BENZYL BUTYL PHTHALATE
2800U 3,3'-DICHLOROBENZIDINE
  1400U 4-CHLOROANILINE
  1400U HEXACHLOROBUTADIENE
                                                                     1400U BENZO(A)ANTHRACENE
  1400U 4-CHLORO-3-METHYLPHENOL
1400U 2-METHYLNAPHTHALENE
1400U HEXACHLOROCYCLOPENTADIENE (HCCP)
                                                                     1400U CHRYSENE
                                                                     14000 BIS(2-ETHYLHEXYL) PHTHALATE
                                                                     1400U DI-N-OCTYLPHTHALATE
         2,4,6-TRICHLOROPHENOL
2,4,5-TRICHLOROPHENOL
  1400U
                                                                     1400U
                                                                            BENZO(B AND/OR K)FLUORANTHENE
  6700Ŭ
                                                                            BENZO-A-PYRENE
                                                                     1400U
  1400UR
         2-CHLORONAPHTHALENE
                                                                     1400U INDENO (1,2,3-CD) PYRENE
  6700U 2-NITROANILINE
                                                                     1400U DIBENZO(A, H) ANTHRACENE
  1400U DIMETHYL PHTHALATE
                                                                     1400U BENZO(GHI)PERYLENE
  1400U ACENAPHTHYLENE
                                                                            PERCENT MOISTURE
  1400U 2.6-DINITROTOLUENE
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REMARKS

REMARKS

FOOTNOTES *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM

EPA-REGION IV ESD, ATHENS, GA. 01/04/91

PURGEABLE ORGANICS DATA REPORT		3.,0.,0.
PROJECT NO. 91-025 SAMPLE NO. 51649 SAMPLE TYPE: S SOURCE: AMAX PHOSPHATE FACIL STATION ID: SD-11	PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1505 STOP	**
	D. NO.: Y159	**
** CASE NO.: 15099 SAS NO.: UG/KG ANALYTICAL RESULTS	UG/KG ANALYTICAL RESULTS	* * * * * * * * * * * * * * * * * * * *
21U CHLOROMETHANE 21U BROMOMETHANE 21U VINYL CHLORIDE 21U CHLOROETHANE 11U METHYLENE CHLORIDE 11U ACETONE 11U CARBON DISULFIDE 11U 1.1-DICHLOROETHENE(1,1-DICHLOROETHYLENE) 11U 1.2-DICHLOROETHANE 11U 1.2-DICHLOROETHENE (TOTAL) 11U CHLOROFORM 11U 1.2-DICHLOROETHANE 21U METHYL ETHYL KETONE 11U 1.1-TRICHLOROETHANE 11U CARBON TETRACHLORIDE 21U VINYL ACETATE 11U BROMODICHLOROMETHANE	11U 1,2-DICHLOROPROPANE 11U CIS-1,3-DICHLOROPROPENE 11U TRICHLOROETHENE(TRICHLOROETHYLENE 11U DIBROMOCHLOROMETHANE 11U 1,1,2-TRICHLOROETHANE 11U BENZENE 11U TRANS-1,3-DICHLOROPROPENE 11U BROMOFORM 21U METHYL ISOBUTYL KETONE 21U METHYL BUTYL KETONE 11U TETRACHLOROETHENE(TETRACHLOROETHY) 11U T.1,2,2-TETRACHLOROETHANE 11U TOLUENE 11U CHLOROBENZENE 11U CHLOROBENZENE 11U STYRENE 11U STYRENE 11U STYRENE 11U TOTAL XYLENES 53 PERCENT MOISTURE	

REMARKS

FOOTNOTES *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN

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REMARKS

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD, ATHENS, GA.

01/04/91

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PESTICIDES/PCB'S DATA REPORT
PROJECT NO. 91-025 SAMPLE NO. 51649 SAMPLE TYPE: SOIL
                                                              PROG ELEM: NSF COLLECTED BY: M GORDON
                                                                                                                   . .
    SOURCE: AMAX PHOSPHATE FACIL
STATION ID: SD-11
                                                              CITY: PALMETTO
..
                                                                                      ST: FL
                                                                                                                   * *
                                                              COLLECTION START: 10/17/90 1505 STOP: 00/00/00
..
                                                                                                                   ..
                             SAS NUMBER:
    CASE NUMBER: 15099
**
                                                               D. NUMBER: Y159
                                                                                                                   ..
..
                                                                                                                   **
   ***
   UG/KG
                     ANALYTICAL RESULTS
                                                              UG/KG
                                                                                ANALYTICAL RESULTS
    33U ALPHA-BHC
                                                              330U METHOXYCHLOR
    33U BETA-BHC
                                                               67U
                                                                   ENDRIN KETONE
    33U DELTA-BHC
                                                                    CHLORDANE (TECH. MIXTURE) /1
    33U GAMMA-BHC (LINDANE)
                                                              330U
                                                                   GAMMA-CHLORDANE
    40U
        HEPTACHLOR
                                                              330U
                                                                    ALPHA-CHLORDANE
    330
        ALDRIN
                                                              670Ū
                                                                    TOXAPHENE
                                                                   PCB-1016 (AROCLOR 1016)
PCB-1221 (AROCLOR 1221)
    330
        HEPTACHLOR EPOXIDE
                                                              330U
        ENDOSULFAN I (ALPHA)
                                                              330U
    330
                                                                   PCB-1232 (AROCLOR 1232)
PCB-1242 (AROCLOR 1242)
PCB-1248 (AROCLOR 1248)
    67U
        DIELDRIN
                                                              3300
    67U 4.4'-DDE (P.P'-DDE)
                                                              330U
    67U ENDRIN
                                                              330U
    67U ENDOSULFAN II (BETA)
67U 4.4'-DDD (P.P'-DDD)
67U ENDOSULFAN SULFATE
                                                              6700 PCB-1254 (AROCLOR 1254)
                                                              670U PCB-1260 (AROCLOR 1260)
                                                                52 PERCENT MOISTURE
    67U 4.4'-DDT (P.P'-DDT)
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REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.
*C-CONFIRMED BY GCMS 1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD, ATHENS, GA.

01/04/91 PURGEABLE ORGANICS DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51669 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO STATION ID: SD-12 COLLECTION START: 10/17/90 1230 STOP: 00/00/00 SAS NO.: CASE NO.: 15099 D. NO.: Y154 ..

ANALYTICAL RESULTS UG/KG **ANALYTICAL RESULTS** UG/KG 7U 1.2-DICHLOROPROPANE 7U CIS-1.3-DICHLOROPROPENE 15U CHLOROMETHANE BROMOMETHANE VINYL CHLORIDE 150 7U TRICHLOROETHENE (TRICHLOROETHYLENE) 150 CHLOROE THANE DIBROMOCHLOROMETHANE 15U 711 METHYLENE CHLORIDE 7U 1.1.2-TRICHLORÖETHANE 70 20U ACETONE BENZENE CARBON DISULFIDE 7Ú TRANS-1.3-DICHLOROPROPENE 7U 1,1-DICHLOROETHENE(1,1-DICHLOROETHYLENE) 7Ü **BROMOFORM** 1,1-DICHLOROETHANE 7U 150 METHYL ISOBUTYL KETONE 1.2-DICHLOROETHENE (TOTAL)
CHLOROFORM 7Ŭ 7U 15U METHYL BUTYL KETONE TETRACHLOROETHENE (TETRACHLOROETHYLENE) 7Ü ŻŬ. 1,2-DICHLOROETHANE ŻŨ. 1,1,2,2-TETRACHLOROETHANE 15Ú MÉTHYL ETHYL KETONE 70 TOLUENE 1.1.1-TRICHLOROETHANE 70 7U **CHLOROBENZENE** CARBON TETRACHLORIDE 7U ETHYL BENZENE 7Ũ VINYL ACETATE STYRENE 7Ŭ BROMODICHLOROMETHANE TOTAL XYLENES PERCENT MOISTURE

REMARKS

REMARKS

FOOTNOTES *A-AVERAGE VALUE *NA-NOT ANALYZED •NAI-INTERFERENCES •J-ESTIMATED VALUE •N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
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SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD. ATHENS. GA.

01/04/91 EXTRACTABLE ORGANICS DATA REPORT PROG ELEM: NSF COLLECTED BY: M GORDON PROJECT NO. 91-025 SAMPLE NO. 51669 SAMPLE TYPE: SOIL SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1230 STOP: 00/00/00 STATION ID: SD-12 --- -• • - -SAS NO.: CASE NO.: 15099 D. NO.: Y154 .. ANALYTICAL RESULTS UG/KG ANALYTICAL RESULTS 970U PHENOL 4700UR 3-NITROANILINE 970U BIS(2-CHLOROETHYL) ETHER 970U ACENAPHTHENE 970U 2-CHLOROPHENOL 4700U 2.4-DINITROPHENOL 970U 1.3-DICHLOROBENZENE 4700U 4-NITROPHENOL 970U 1.4-DICHLOROBENZENE 970U BENZYL ALCOHOL 970U DIBENZOFURAN 970U 2.4-DINITROTOLUENE 1.2-DICHLOROBENZENE 9700 970U DIETHYL PHTHALATE 970U 2-METHYLPHENOL 970U 4-CHLOROPHENYL PHENYL ETHER 970UR BIS(2-CHLOROISOPROPYL) ETHER 970U FLUORENE (3-AND/OR 4-)METHYLPHENOL 4700U 4-NITROANTI INF 97011 970U N-NITROSODI-N-PROPYLAMINE 4700U 2-METHYL-4.6-DINITROPHENOL 970U N-NITROSODÍPHENYLAMINE/DIPHENYLAMINE 970U HEXACHLOROETHANE 970U 4-BROMOPHENYL PHENYL ETHER NITROBENZENE 970UR 970U HEXACHLOROBENZENE (HCB) 97011 ISOPHORONE 2-NITROPHENOL 970Ü 4700U PENTACHLOROPHENOL 2,4-DIMETHYLPHENOL 9700 970U PHENANTHRENE 4700U BENZOIC ACID 970U ANTHRACENE 97011 BIS(2-CHLOROETHOXY) METHANE 970U DI-N-BUTYLPHTHALATE 2 4-DICHLOROPHENOL 9700 970U FLUORANTHENE 970UR 1.2.4-TRICHLOROBENZENE 970U PYRENE 970U NAPHTHALENE 970U BENZYL BUTYL PHTHALATE 97011 4-CHLOROANILINE 1900U 3.3'-DICHLOROBENZIDINE 9700 HEXACHLOROBUTADIENE 9700 BENZO(A)ANTHRACENE 4-CHLORO-3-METHYLPHENOL 970U 9700 CHRYSÈNÉ 2-METHYLNAPHTHALENE 970U 970U BIS(2-ETHYLHEXYL) PHTHALATE 970U HEXACHLOROCYCLOPENTADIENE (HCCP) 970U DI-N-OCTYLPHTHALATE 2.4.6-TRICHLOROPHENOL 970U 970U BENZO(B AND/OR K)FLUORANTHENE 2.4.5-TRICHLOROPHENOL BENZO-A-PYRENE 4700U 970U 970UR 2-CHLORONAPHTHALENE 970U INDENO (1,2,3-CD) PYRENE 4700U 2-NITROANILINE 970U DIBENZO(A.H)ANTHRACENE 9708 DIMETHYL PHTHALATE 970U BENZO(GHI)PERYLENE ACENAPHTHYLENE 9701 32 PERCENT MOISTURE

RFMARKS

970U

2.6-DINITROTOLUENE

REMARKS

FOOTNOTES

*A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

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SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD. ATHENS. GA.

01/04/91

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**

MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT

PROJECT NO. 91-025 SAMPLE NO. 51669 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON

SOURCE: AMAX PHOSPHATE FACIL **

CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1230 STOP: 00/00/00 STATION ID: SD-12

CASE NO : 15099 SAS NO.: D. NO.: Y154 MD NO: Y154

ANALYTICAL RESULTS UG/KG

1000JN HEXADECANOIC ACID 3000J 2 UNIDENTIFIED COMPOUNDS

FOOTNOTES

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**

^{*}NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *A-AVERAGE VALUE *NA-NOT ANALYZED

^{*}K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD. ATHENS. GA.

01/04/91 PESTICIDES/PCB'S DATA REPORT

```
PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO
    PROJECT NO. 91-025 SAMPLE NO. 51669 SAMPLE TYPE: SOIL
* *
    SOURCE: AMAX PHOSPHATE FACIL
. .
                                                            COLLECTION START: 10/17/90 1230 STOP: 00/00/00
    STATION ID: SD-12
. .
                                                                                                                * *
    CASE NUMBER: 15099
                            SAS NUMBER:
                                                             D. NUMBER: Y154
                                                                                                               * *
                                                                                                                * *
ANALYTICAL RESULTS
                                                            UG/KG
                                                                             ANALYTICAL RESULTS
   UG/KG
    24U ALPHA-BHC
                                                            240U METHOXYCHLOR
    24U BETA-BHC
                                                             47U
                                                                 ENDRIN KETONE
    24U DELTA-BHC
                                                                  CHLORDANE (TECH. MIXTURE) /1
    24U GAMMA-BHC (LINDANE)
                                                            240U GAMMA-CHLORDANE
                                                                                /2
    24U HEPTACHLOR
                                                            240U ALPHA-CHLORDANE
    24U ALDRIN
                                                            470U TOXAPHENE
    24U HEPTACHLOR EPOXIDE
                                                            240U PCB-1016 (AROCLOR 1016)
                                                            240U PCB-1221 (AROCLOR 1221)
240U PCB-1232 (AROCLOR 1232)
240U PCB-1242 (AROCLOR 1242)
240U PCB-1248 (AROCLOR 1248)
    240 ENDOSULFAN I (ALPHA)
    47U DIELDRIN
    47U 4.4'-DDE (P.P'-DDE)
    47U ENDRIN
                                                            4700 PCB-1254 (AROCLOR 1254)
4700 PCB-1260 (AROCLOR 1260)
    47U ENDOSULFAN II (BETA)
    470 4,4' DDD (P,P' DDD)
    47U ENDOSULFAN SULFATE
                                                              32 PERCENT MOISTURE
    47U 4.4'~DDT (P.P'-DDT)
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REMARKS

REMARKS

^{*}NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *A-AVERAGE VALUE *NA-NOT ANALYZED

^{*}K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT. *R-OC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RÉSAMPLING AND RÉANALYSIS IS NECESSARY FOR VERIFICATION. *C-CONFIRMED BY GCMS 1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

PURGEABLE ORGANICS DATA REPORT	EFA REGION IV ESD, ATHENS, GA.	01/04/91
	E TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/16/90 1330 STOP: 00/00	0/00
	NO.: D. NO.: Y137	**
UG/L ANALYTICAL RESULTS	UG/L ANALYTICAL RESULTS	* * * * * * * **
10U CHLOROMETHANE 10U BROMOMETHANE 10U VINYL CHLORIDE 10U CHLOROETHANE 5U METHYLENE CHLORIDE 10U ACETONE 5U CARBON DISULFIDE 5U 1.1-DICHLOROETHENE(1.1-DICHLOROETHYLENE) 5U 1.2-DICHLOROETHANE 5U 1.2-DICHLOROETHANE 5U CHLOROFORM 5U 1.2-DICHLOROETHANE 10U METHYL ETHYL KETONE 5U 1.1-TRICHLOROETHANE 5U CARBON TETRACHLORIDE 10U VINYL ACETATE 5U BROMODICHLOROMETHANE	5U 1.2-DICHLOROPROPANE 5U CIS-1.3-DICHLOROPROPENE 5U TRICHLOROETHENE(TRICHLOROETHYLENE) 5U DIBROMOCHLOROMETHANE 5U 1.1.2-TRICHLOROETHANE 5U BENZENE 5U TRANS-1.3-DICHLOROPROPENE 5U BROMOFORM 10U METHYL ISOBUTYL KETONE 10U METHYL BUTYL KETONE 5U TETRACHLOROETHENE(TETRACHLOROETHYLENE) 5U 1.1.2.2-TETRACHLOROETHANE 5U TOLUENE 5U CHLOROBENZENE 5U STYRENE 5U TOTAL XYLENES	

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
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*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

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EXTRACTABLE ORGANICS DATA REPORT
PROJECT NO. 91-025 SAMPLE NO. 51674 SAMPLE TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON
    SOURCE: AMAX PHOSPHATE FACIL
                                                                      CITY: PALMETTO ST: FL
COLLECTION START: 10/16/90 1330 STOP: 00/00/00
                                                                      CITY: PALMETTO
    STATION ID: SW-01
..
                                                                                                                                  . .
.
                                                                                                                                  * *
                                               SAS NO.:
   CASE NO.: 15099
                                                                       D. NO.: Y137
..
                                                                                                                                  ..
   UG/L
                       ANALYTICAL RESULTS
                                                                     UG/L
                                                                                          ANALYTICAL RESULTS
     10U PHENOL
                                                                       50U 3-NITROANILINE
    100 BIS(2-CHLOROETHYL) ETHER
100 2-CHLOROPHENOL
                                                                        10U ACENAPHTHENE
                                                                       50U 2.4-DINITROPHENOL
    10U 1,3-DICHLOROBENZENE
                                                                       50U 4-NITROPHENOL
10U DIBENZOFURAN
    100 1.4-DICHLOROBENZENE
100 BENZYL ALCOHOL
                                                                        100
                                                                            2.4-DINITROTOLUENE
    10U 1,2-DICHLOROBENZENE
                                                                        100 DIETHYL PHTHALATE
    100 2-METHYLPHENOL
                                                                           4-CHLOROPHENYL PHENYL ETHER
                                                                       100
    10U BIS(2-CHLOROISOPROPYL) ETHER
                                                                       10U FLUORENE
     10U (3-AND/OR 4-)METHYLPHENOL
                                                                       50U 4-NITROANILINE
    10U N-NITROSODI-N-PROPYLAMINE
                                                                       50U 2-METHYL-4,6-DINITROPHENOL
    100 HEXACHLOROETHANE
                                                                        10U N-NITROSODIPHENYLAMINE/DIPHENYLAMINE
                                                                       10U 4-BROMOPHENYL PHENYL ETHER
10U HEXACHLOROBENZENE (HCB)
50U PENTACHLOROPHENOL
    10U NITROBENZENE
    100 ISOPHORONE
100 2-NITROPHENOL
    10U 2.4-DIMETHYLPHENOL
                                                                            PHENANTHRENE
                                                                        100
    500 BENZOIC ACID
                                                                            ANTHRACENE
                                                                        100
    100 BIS(2-CHLOROETHOXY) METHANE
                                                                           DI-N-BUTYLPHTHALATE
                                                                       10UJ
    10U 2.4-DICHLOROPHENOL
10U 1.2.4-TRICHLOROBENZENE
                                                                        10U
                                                                           FLUORANTHENE
                                                                       100
                                                                            PYRENE
    100 NAPHTHALENE
                                                                        100
                                                                            BENZYL BUTYL PHTHALATE
                                                                            3.3'-DICHLOROBENZIDINE
BENZO(A)ANTHRACENE
    10U 4-CHLOROANILINE
                                                                       20U
     10U HEXACHLOROBUTADIENE
                                                                       10UJ
    10U 4-CHLORO-3-METHYLPHENOL
10U 2-METHYLNAPHTHALENE
                                                                            CHRYSENE
                                                                       100
                                                                        100
                                                                            BIS(2-ETHYLHEXYL) PHTHALATE
    10U HEXACHLOROCYCLOPENTADIENE (HCCP)
                                                                       100
                                                                            DI-N-OCTYLPHTHALATE
                                                                            BENZO(B AND/OR K)FLUORANTHENE
BENZO-A-PYRENE
    10U 2.4.6-TRICHLOROPHENOL
50U 2.4.5-TRICHLOROPHENOL
                                                                       10U
    10U 2-CHLORONAPHTHALENE
50U 2-NITROANILINE
                                                                           INDENO (1,2,3-CD) PYRENE
DIBENZO(A,H)ANTHRACENE
                                                                       100
                                                                       100
    100 DIMETHYL PHTHALATE
                                                                            BENZO(GHI)PERYLENE
    10U ACENAPHTHYLENE
         2.6-DINITROTOLUENE
```

REMARKS

100

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM

EPA-REGION IV ESD, ATHENS, GA. 01/04/91

PESTICIDES/PCB'S DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51674 SAMPLE TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO ** ST: FL * * COLLECTION START: 10/16/90 1330 STOP: 00/00/00 .. STATION ID: SW-01 . . SAS NUMBER: CASE NUMBER: 15099 D. NUMBER: Y137 ANALYTICAL RESULTS UG/L UG/L ANALYTICAL RESULTS 0.050U ALPHA-BHC O.50U METHOXYCHLOR 0.0500 BETA-BHC O. 10U ENDRIN KETONE CHLORDANE (TECH. MIXTURE) /1 0.050ช DELTA-BHC 0.0500 GAMMA-BHC (LINDANE) 0.500 GAMMA-CHLORDANE 0.050U HEPTACHLOR 0.500 ALPHA-CHLORDANE 0.0500 AL DRIN 1.00 TOXAPHENE 0.500 PCB-1016 (AROCLOR 1016) PCB-1221 (AROCLOR 1221) HEPTACHLOR EPOXIDE 0.0500 0.500 ENDOSULFAN I (ALPHA) 0.0500 O. 10U DIELDRIN 0.50U PCB-1232 (AROCLOR 1232) 0.10U 4,4'-DDE (P,P'-DDE) 0.500 PCB-1242 (AROCLOR 1242) O. 100 ENDRIN 0.500 PCB-1248 (AROCLOR 1248) O 10U ENDOSULFAN II (BETA) O 10U 4,4' DDD (P,P' DDD) 1.00 PCB-1254 (AROCLOR 1254) 1.OU PCB 1260 (AROCLOR 1260) 0.24 ENDOSULFAN SULFATE 0.10U 4,4'-DDT (P,P'-DDT)

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

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^{1.} WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS. *C-CONFIRMED BY GCMS

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD. ATHENS. GA 01/04/91 PURGEARI E ORGANICS DATA REPORT ** PROJECT NO. 91-025 SAMPLE NO. 51677 SAMPLE TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON / ** SOURCE: AMAX PHOSPHATE FACTI ST: FL CITY: PALMETTO . . STATION ID: SW-02 COLLECTION START: 10/16/90 1415 STOP: 00/00/00 CASE NO.: 15099 SAS NO.: D. NO.: Y141 . . ANALYTICAL RESULTS UG/L ANALYTICAL RESULTS UG/L 100 CHLOROMETHANE 5U 1.2-DICHLOROPROPANE 5U CIS-1.3-DICHLOROPROPENE 10U BROMOMETHANE

100 VINYL CHLORIDE 5U TRICHLOROETHENE (TRICHLOROETHYLENE) 10U CHLOROETHANE 511 DIBROMOCHI OROMETHANE 200 METHYLENE CHLORIDE 5U 1.1.2-TRICHLOROETHANE SU BÉNZÈNE 20Ŭ ACETONE CARBON DISULFIDE 1,1-DICHLOROETHENE(1,1-DICHLOROETHYLENE) 5ŭ TRANS-1.3-DICHLOROPROPENE 50 ŠŬ Sii BROMOFORM 1.1-DICHLOROETHANE METHYL ISOBUTYL KETONE 100 METHYL BUTYL KETONE 1.2-DICHLOROETHENE (TOTAL) 100 CHLOROFORM TETRACHLOROETHENE (TETRACHLOROFTHYLENE) ŠŬ. 5Ü 1.2-DICHLOROETHANF ŠĬ. 1.1.2.2-TETRACHLOROETHANE 101 METHYL ETHYL KETONE SII TÓL ÚF NF 1.1.1-TRICHLOROETHANE Sil **CHLOROBENZENE** CARBON TETRACHLORIDE 5Ŭ ETHYL BENZENE VINYL ACETATE 5Ŭ 10Ú STYRENE **BROMODICHLOROMETHANE** TOTAL XYLENES

REMARKS

REMARKS

FOOTNOTES *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD, ATHENS, GA.

01/04/91 EVIDACIARIE ORGANICS DATA REPORT

EXTRACTABLE ORGANICS DATA REPORT	
** PROJECT NO. 91-025 SAMPLE NO. 51677 SAMPLE TYPE: SURFACEWA	PROG ELEM: NSF COLLECTED BY: M GORDON **
** SOURCE: AMAX PHOSPHATE FACIL	CITY: PALMETTO ST: FI **
•• STATION ID: SW-02	COLLECTION START: 10/16/90 1415 STOP: 00/00/00 **
## CASE NO - 15000 SAS NO -	D NO V141
** CASE NO.: 15099 SAS NO.:	* * * * * * * * * * * * * * * * * * * *
	UG/L ANALYTICAL RESULTS
10U PHENOL 10U BIS(2-CHLOROETHYL) ETHER 10U 2-CHLOROPHENOL 10U 1,3-DICHLOROBENZENE 10U 1,4-DICHLOROBENZENE 10U 1,2-DICHLOROBENZENE 10U 2-METHYLPHENOL 10U 8IS(2-CHLOROISOPROPYL) ETHER 10U (3-AND/OR 4-)METHYLPHENOL 10U N-NITROSODI-N-PROPYLAMINE 10U N-NITROSODI-N-PROPYLAMINE 10U NITROBENZENE 10U ISOPHORONE 10U 15OPHORONE 10U 2,4-DIMETHYLPHENOL 50U BENZOIC ACID 10U BIS(2-CHLOROETHOXY) METHANE 10U 2,4-DICHLOROPHENOL 10U 2,4-DICHLOROPHENOL 10U 2,4-TRICHLOROBENZENE 10U 1.2.4-TRICHLOROBENZENE 10U 4-CHLORO-3-METHYLPHENOL 10U 4-CHLORO-3-METHYLPHENOL 10U 2-METHYLNAPHTHALENE 10U 4-STRICHLOROPHENOL 10U 2-METHYLNAPHTHALENE 10U 4-CHLOROCYCLOPENTADIENE (HCCP) 10U 2-4.6-TRICHLOROPHENOL 50U 2-4.6-TRICHLOROPHENOL 50U 2-CHLORONAPHTHALENE 10U DIMETHYL PHTHALENE	50U 3-NITROANILINE
10U BIS(2~CHLOROETHYL) ETHER	10U ACENAPHTHÊNÊ
100 Ž-CHLOROPHENOL	50U 2,4-DINITŘOPHENOL
10U 1,3-DICHLOROBENZENE	5QU 4-NITROPHENOL
10U 1.4-DICHLOROBENZENE	10U DIBENZOFURAN
10U BENZYL ALCOHOL	10U 2.4-DINITROTOLUENE
10U 1,Z-DICHLUNDENZENE	10U ĎÍETHÝL PHŤHALAŤĚ 10U 4-CHLOROPHENYL PHENYL ETHER
100 2-METHICHOLOGISOPROPYL) FTHER	100 FLUORENE
10U (3-AND/OR 4-)METHYLPHÉNOL	50U 4-NITROANILINE
10U N-NITROSODI-N-PROPYLAMINE	50U 2-METHYL-4,6-DINITROPHENOL
10U HEXACHLOROETHANE	10U N-NITROSODIPHENYLAMINE/DIPHENYLAMINE 10U 4 BROMOPHENYL PHENYL ETHER
10U NITROBENZENE	10U 4 BROMOPHENYL PHENYL ETHER
10U ISOPHORONE	10U HEXACHLOROBENZENE (HCB)
100 Z-NI PROPHENOL	50U PENTACHLOROPHENOL 10U PHENANTHRENE
SOU BENZOIC ACID	10U ANTHRACENE
10U BIS(2-CHLOROETHOXY) METHANE	10UJ DI-N-BUTYLPHTHALATE
10U 2.4-DICHLOROPHENOL	100 FLUORANTHENE
1QU 1,2,4-TRICHLOROBENZENE	10U PYRENE
10U NAPHTHALENE	10U BENZYL BUTYL PHTHALATE
10U 4-CHLOROANILINE	20U 3,3'-DICHLOROBENZIDINE
100 HEARCHLUNGDO TADIENE 1011 A-CHI ORO-3-METHYU DHENDI	10UJ BENZO(A)ANTHRACENE 10U CHRYSENE
10U 2-METHYL NAPHTHALENE	100 BIS(2-ETHYLHEXYL) PHTHALATE
10U HEXACHLOROCYCLOPENTADIENE (HCCP)	10U DI-N-OCTYLPHTHALATE
10U 2.4.6-TRICHLOROPHENOL	10Ú BÉNZO(B AÑD/OR K)FLUORANTHENE 10U BENZO-A-PYRENE
50U 2.4.5-TRICHLOROPHENOL	10U BENZO-A-PYRENE
10U Z-CHLURONAPHTHALENE	10U INDENO (1,2,3-CD) PYRENE
OU Z-NITRUANILINE 10H DIMETUVI DUTUALATE	10U DIBENZO(A,H)ANTHRACENE 10U BENZO(GHI)PERYLENE
100 ACENAPHTHYLENE	100 DENZO(GAI) PERTLENE
10U 2,6-DINITROTOLUENE	
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REMARKS ***REMARKS***

^{***}FOOINOTES***

*A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD. ATHENS. GA.

01/04/91

	EPA-REGION IV ESU, ATHENS, GA.	01/04/91
PESTICIDES/PCB'S DATA REPORT		
	* * * * * * * * * * * * * * * * * * * *	
PROJECT NO. 91-025 SAMPLE NO. 51677 SAMPLE SOURCE: AMAX PHOSPHATE FACIL STATION ID: SW-02 CASE NUMBER: 15099 SAS NUMBER:	CITY: PALMETTO ST: FL	**
**		**
UG/L ANALYTICAL RESULTS	UG/L ANALYTICAL RESULTS	
0.050U ALPHA-BHC 0.050U BETA-BHC 0.050U DELTA-BHC 0.050U GAMMA-BHC (LINDANE) 0.050U HEPTACHLOR 0.050U ALDRIN 0.050U HEPTACHLOR EPOXIDE 0.050U ENDOSULFAN I (ALPHA) 0.10U DIELDRIN 0.10U DIELDRIN 0.10U 4.4'-DDE (P.P'-DDE) 0.10U ENDRIN 0.10U ENDOSULFAN II (BETA) 0.10U 4.4' DDD (P.P' DDD) 0.10U ENDOSULFAN SULFATE 0.10U 4.4'-DDT (P.P'-DDT)	O.50U METHOXYCHLOR O.10U ENDRIN KETONE CHLORDANE (TECH. MIXTURE) /1 O.50U GAMMA-CHLORDANE /2 O.50U ALPHA-CHLORDANE /2 1.0U TOXAPHENE O.50U PCB-1016 (AROCLOR 1016) O.50U PCB-1221 (AROCLOR 1221) O.50U PCB-1232 (AROCLOR 1232) O.50U PCB-1242 (AROCLOR 1242) O.50U PCB-1248 (AROCLOR 1248) 1.0U PCB-1254 (AROCLOR 1254) 1.0U PCB-1260 (AROCLOR 1260)	

REMARKS

REMARKS

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*C-CONFIRMED BY GCMS 1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD, ATHENS, GA.

01/04/91

PURGEABLE ORGANICS DATA REPORT SAMPLE NO. 51646 SAMPLE TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON PROJECT NO. 91-025 SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO ST: FL ** STATION ID: SW-04 COLLECTION START: 10/17/90 1620 STOP: 00/00/00 **

SAS NO.: CASE NO.: 15099 D. NO.: Y167 **

ANALYTICAL RESULTS UG/L **ANALYTICAL RESULTS** UG/L 10U CHLOROMETHANE 5U 1.2-DICHLOROPROPANE 10U BROMOMETHANE 5U CIS-1.3-DICHLOROPROPENE 5U TRICHLOROETHENE (TRICHLOROETHYLENE) 10U VINYL CHLORIDE 10U CHLOROETHANE 5U DIBROMOCHLOROMETHANE 200 METHYLENE CHLORIDE 5U 1.1.2-TRICHLOROETHANE 10U ACETONE 5U BENZENE CARBON DISULFIDE
1,1-DICHLOROETHENE(1,1-DICHLOROETHYLENE) TRANS-1.3-DICHLOROPROPENE 50 5U BROMOFORM 5U 100 METHYL ISOBUTYL KETONE 100 METHYL BUTYL KETONE 1,1-DICHLOROETHANE 5U 50 1.2-DICHLOROETHENE (TOTAL) 5U TETRACHLOROETHENE (TETRACHLOROETHYLENE) 50 CHLOROFORM 5U 1.2-DICHLOROETHANE 5U 1,1,2,2-TETRACHLOROETHANE 10UR MÉTHYL ETHYL KETONE SU. TOLUENE 1, 1, 1-TRICHLORGE THANE 50 CHLOROBENZENE 5Ú CARBON TETRACHLORIDE 5U ETHYL BENZENE

REMARKS

100

VINYL ACETATE

BROMODICHLOROMETHANE

REMARKS

5U

STYRENE

TOTAL XYLENES

FOOTNOTES

*A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT. *R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

01/04/91

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EXTRACTABLE ORGANICS DATA REPORT
PROJECT NO. 91-025 SAMPLE NO. 51646 SAMPLE TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON SOURCE: AMAX PHOSPHATE FACIL ST: FL
                                                                          CITY: PALMETTO ST: FL
COLLECTION START: 10/17/90 1620 STOP: 00/00/00
..
                                                                                                                                         ..
     STATION ID: SW-04
..
                                                                                                                                         ..
..
                                                                                                                                         ..
   CASE NO.: 15099
                                                  SAS NO.:
                                                                           D. NO.: Y167
                                                                                                                                         ..
ANALYTICAL RESULTS
                                                                         UG/L
                                                                                              ANALYTICAL RESULTS
                                                                           50U 3-NITROANILINE
     10U PHENOL
     100 BIS(2-CHLOROETHYL) ETHER
100 2-CHLOROPHENOL
                                                                            10U ACENAPHTHENE
                                                                                2.4-DINITROPHENOL
                                                                           50U
                                                                           500 4-NITROPHENOL
     10U 1,3-DICHLOROBENZENE
     10U 1.4-DICHLOROBENZENE
                                                                           100 DIBENZOFURAN
     100 BENZYL ALCOHOL
                                                                           100 2.4-DINITROTOLUENE
100 DIETHYL PHTHALATE
     100 1.2-DICHLOROBENZENE
     100 2-METHYLPHENOL
                                                                           10U 4-CHLOROPHENYL PHENYL ETHER
     10U BIS(2-CHLOROISOPROPYL) ETHER
10U (3-AND/OR 4-)METHYLPHENOL
10U N-NITROSODI-N-PROPYLAMINE
                                                                           100 FLUORENE
                                                                           50U 4-NITROANILINE
                                                                           50U 2-METHYL-4.6-DINITROPHENOL
10U N-NITROSODIPHENYLAMINE/DIPHENYLAMINE
10U 4 BROMOPHENYL PHENYL ETHER
     100 HEXACHLOROETHANE
     100 NITROBENZENE
     10U ISOPHORONE
                                                                           10U HEXACHLOROBENZENE (HCB)
     10U 2-NITROPHENOL
                                                                           500 PENTACHLOROPHENOL
     10U 2.4-DIMETHYLPHENOL
                                                                           100 PHENANTHRENE
     SOU BENZOIC ACID
                                                                                ANTHRACENE
                                                                           100
     10U BIS(2-CHLOROETHOXY) METHANE
10U 2,4-DICHLOROPHENOL
10U 1,2,4-TRICHLOROBENZENE
                                                                           10UJ DI-N-BUTYLPHTHALATE
                                                                           10U FLUORANTHENE
                                                                           100
                                                                                PYRENE
     100 NAPHTHALENE
                                                                                BENZYL BUTYL PHTHALATE
                                                                           100
                                                                          20U 3.3'-DICHLOROBENZIDINE
10UJ BÉNZO(A)ANTHRACENE
     10U 4-CHLOROANILINE
     10U HEXACHLOROBUTADIENE
     10U 4-CHLORO-3-METHYLPHENOL
                                                                           100 CHRYSENE
     10U 2-METHYLNAPHTHALENE
                                                                           100 BIS(2-ETHYLHEXYL) PHTHALATE
     10U HEXACHLOROCYCLOPENTADIENE (HCCP)
                                                                           100 DI-N-OCTYLPHTHALATE
    10U 2.4.6-TRICHLOROPHENOL
50U 2.4.5-TRICHLOROPHENOL
10U 2-CHLORONAPHTHALENE
50U 2-NITROANILINE
                                                                           10U BENZO(B AND/OR K)FLUORANTHENE
                                                                           100 BENZO-A-PYRENE
                                                                                INDENO (1.2.3-CD) PYRENE
DIBENZO(A.H)ANTHRACENE
                                                                           10u
                                                                           100
     100 DIMETHYL PHTHALATE
100 ACENAPHTHYLENE
                                                                           100 BENZO(GHI)PERYLENE
     10U 2.6-DINITROTOLUENE
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REMARKS

REMARKS

^{*}NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

^{*}R-QC ÎNDICATES THAT DATA UNUSABLE, COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD, ATHENS, GA.

01/04/91

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MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT

PROJECT NO. 91-025 SAMPLE NO. 51646 SAMPLE TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON

SOURCE: AMAX PHOSPHATE FACIL

CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1620 STOP: 00/00/00 D. NO.: Y167 MD NO: Y167 STATION ID: SW-04 CASE.NO.: 15099 SAS NO.:

* *

ANALYTICAL RESULTS UG/L

4JN BROMACIL

FOOTNOTES

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^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD, ATHENS, GA.

01/04/91

PESTICIDES/PCB'S DATA REPORT	ETA REGION IV COD, ATTEMS, GA.	01/04/91
PESTICIDES/PCD 3 DATA REPORT	**********	
** PROJECT NO. 91-025 SAMPLE NO. 51646 SAMPLE		**
** SOURCE: AMAX PHOSPHATE FACIL	CITY: PALMETTO ST: FL	**
** STATION ID: SW-04	COLLECTION START: 10/17/90 1620 STOP:	00/00/00 **
** CASE NUMBER: 15099 SAS NUMBER:	D. NUMBER: Y167	11
**		**

UG/L ANALYTICAL RESULTS	UG/L ANALYTICAL RESULTS	
O.OSOU ALPHA-BHC	O.50U METHOXYCHLOR	
O. OSOU BETA-BHC	O.10U ENDRIN KETONE	
O.OSOU DELTA-BHC	CHLORDANE (TECH. MIXTURE) /1	
O. 050U GAMMA-BHC (LINDANE)	O 50U GAMMA-CHLORDANE /2	
O.O5OU HEPTACHLOR	0.50U ALPHA-CHLORDANE /2	
O.OSOU ALDRIN	1.OU TOXAPHENE	
O.OSOU HEPTACHLOR EPOXIDE	0.50U PCB-1016 (AROCLOR 1016)	
0.050U ENDOSULFAN I (ALPHA)	0.50U PCB-1221 (AROCLOR 1221)	
O. 10U DIELDRIN	0.50U PCB-1232 (AROCLOR 1232)	
0.10U 4,4'-DDE (P.P'-DDE)	0.50U PCB-1242 (AROCLOR 1242)	
O. 10U ENDRIN	0.50U PCB-1248 (AROCLOR 1248)	
O.10U ENDOSULFAN II (BETA)	1.0U PCB-1254 (AROCLOR 1254)	
0.10U 4.4'-DDD (P.P'-DDD)	1.0U PCB 1260 (AROCLOR 1260)	
O.20U ENDOSULFAN SULFATE		
O.10U 4.4'-DDT (P.P'-DDT)		

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.
*C-CONFIRMED BY GCMS

1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD. ATHENS, GA.

01/04/91

PURGEABLE ORGANICS DATA REPORT	, or the total of	01/04/31
*** * * * * * * * * * * * * * * * * * *		* * * * * * * * * * * * * * * * * * * *
** PROJECT NO. 91-025 SAMPLE NO. 51644 SAMPLE TYPE: SURFACEWA	PROG ELEM: NSF COLLECTED BY: M GORDON	**
** SOURCE: AMAX PHOSPHATE FACIL	CITY: PALMETTO ST: FL	**
** STATION ID: SW-05	COLLECTION START: 10/17/90 1645 STOP: 00	/00/00 **
**	• • • • • • • • • • • • • • • • • • • •	••
• * CASE NO.: 15099 SAS NO.:	D. NO.: Y169	**
	* * * * * * * * * * * * * * * * * * * *	
UG/L ANALYTICAL RESULTS	UG/L ANALYTICAL RESULTS	
ADV. CUI OPOMETUANE	FIL 4 A DICH OPODDODANE	
10U CHLOROMETHANE	5U 1.2-DICHLOROPROPANE	
10U BROMOMETHANE	5U CIS-1, 3-DICHLOROPROPENE	
10U VINYL CHLORIDE 10U CHLOROETHANE	5U TRICHLOROETHENE (TRICHLOROETHYLENE)	
	5U DIBROMOCHLOROMETHANE 5U 1.1.2-TRICHLOROETHANE	
30U METHYLENE CHLORIDE 10U ACETONE	50 F. T. 2-TRICHLORGE THANE	
SU CARBON DISULFIDE	50 BENZENE 50 TRANS-1,3-DICHLOROPROPENE	
5U 1,1-DICHLOROETHENE(1,1-DICHLOROETHYLENE)	5U BROMOFORM	
5U 1,1-DICHLOROETHANE	100 METHYL ISOBUTYL KETONE	
5U 1,2-DICHLOROETHENE (TOTAL)	10U METHYL BUTYL KETONE	
	5U TETRACHLOROETHENE (TETRACHLOROETHYLENE)
5U CHLOROFORM 5U 1,2-DICHLOROETHANE	5U 1,1,2,2-TETRACHLOROETHANE	•
10ŬŘ MĚŤIÝĽ EŤIÝĽ KETONE	5U TOLUENE	
SU 1.1.1-TRICHLOROETHANE	5U CHLOROBENZENE	
50 CÁRBON TETRACHLORIDE	5U ETHYL BENZENE	•
10U VINYL ACETATE	5U STYRENE	
5U BROMODICHLOROMETHANE	5U TOTAL XYLENES	

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

01/04/91

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EXTRACTABLE ORGANICS DATA REPORT
PROJECT NO. 91-025 SAMPLE NO. 51644 SAMPLE TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON SOURCE: AMAX PHOSPHATE FACIL ST: FL
    SOURCE: AMAX PHOSPHATE FACIL
STATION ID: SW-05
                                                                           CITY: PALMETTO ST: FL
COLLECTION START: 10/17/90 1645 STOP: 00/00/00
                                                                                                                                          . .
..
                                                                                                                                          ..
   CASE NO.: 15099
                                                  SAS NO.:
                                                                           D. NO.: Y169
                                                                                                                                          ..
ANALYTICAL RESULTS
    UG/L
                                                                         UG/L
                                                                                               ANALYTICAL RESULTS
     10U PHENOL
                                                                            50U 3-NITROANILINE
     100 BIS(2-CHLOROETHYL) ETHER
100 2-CHLOROPHENOL
                                                                            10U ACENAPHTHENE
                                                                            50U 2,4-DINITROPHENOL
     100 1.3-DICHLOROBENZENE
100 1.4-DICHLOROBENZENE
                                                                            50U 4-NITROPHENOL
                                                                            10U DIBENZOFURAN
     100 BENZYL ALCOHOL
100 1,2-DICHLOROBENZENE
                                                                            10U 2.4-DINITROTOLUENE
                                                                            100 DIETHYL PHTHALATE
     100 2-METHYLPHENOL
                                                                            10U 4-CHLOROPHENYL PHENYL ETHER
     100 BIS(2-CHLOROISOPROPYL) ETHER
                                                                            100 FLUORENE
     10U (3-AND/OR 4-)METHYLPHENOL
                                                                            50U 4-NITROANILINE
     10U N-NITROSODI-N-PROPYLAMINE
10U HEXACHLOROETHANE
10U NITROBENZENE
                                                                           50U 2-METHYL-4.6-DINITROPHENOL
10U N-NITROSODIPHENYLAMINE/DIPHENYLAMINE
                                                                            10U 4 BROMOPILENYL PHENYL ETHER
10U HEXACHLOROBENZENE (HCB)
     10U ISOPHORONE
     10U 2-NITROPHENOL
                                                                            50U PENTACHLOROPHENOL
     10U 2.4-DIMETHYLPHENOL
                                                                            10U PHENANTHRENE
     SOU BENZOIC ACID
                                                                            10U ANTHRACENE
     100 BIS(2-CHLOROETHOXY) METHANE
                                                                           10UJ DI-N-BUTYL PHTHALATE
     10U 2.4-DICHLOROPHENOL
10U 1.2.4-TRICHLOROBENZENE
10U NAPHTHALENE
                                                                            100 FLUORANTHENE
                                                                            100 PYRENE
                                                                            100 BENZYL BUTYL PHTHALATE
     10U 4-CHLOROANILINE
                                                                                3,3'-DICHLOROBENZIDINE
                                                                            20U
     100 HEXACHLOROBUTADIENE
                                                                                 BENZO(A)ANTHRACENE
                                                                           10UJ
     10U 4-CHLORO-3-METHYLPHENOL
                                                                                 CHRYSENE
                                                                            100
    10U 2-METHYLNAPHTHALENE
10U HEXACHLOROCYCLOPENTADIENE (HCCP)
10U 2.4.6-TRICHLOROPHENOL
                                                                            10U BIS(2-ETHYLHEXYL) PHTHALATE
10U DI-N-OCTYLPHTHALATE
                                                                            10U BENZO(B AND/OR K)FLUORANTHENE
     50U 2.4,5-TRICHLOROPHENOL
                                                                            100 BENZO-A-PYRENE
                                                                            10U INDENO (1.2.3-CD) PYRENE
10U DIBENZO(A,H)ANTHRACENE
     10U 2-CHLORONAPHTHALENE
50U 2-NITROANILINE
     100 DIMETHYL PHTHALATE
100 ACENAPHTHYLENE
                                                                            100 BENZO(GHI)PERYLENE
     10U 2.6-DINITROTOLUENE
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REMARKS

REMARKS

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SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD, ATHENS, GA.

01/04/91

PESTICIDES/PCB'S DATA REPORT *** PROJECT NO. 91-025 SAMPLE NO. 51644 SAMPLE TYPE: SURFACEWA SOURCE: AMAX PHOSPHATE FACIL *** STATION ID: SW-05 *** CASE NUMBER: 15099 SAS NUMBER: *** UG/L ANALYTICAL RESULTS *** O.050U ALPHA-BHC O.050U BETA-BHC O.050U DELTA-BHC O.050U DELTA-BHC O.050U DELTA-BHC O.050U DELTA-BHC O.050U DELTA-BHC O.050U GAMMA-BHC (LINDANE) O.050U HEPTACHLOR O.050U HEPTACHLOR O.050U ALPHA-CHLORDANE /2 O.050U HEPTACHLOR
** SOURCÉ: AMAX PHOSPHATE FACIL ** STATION ID: SW-05 ** CASE NUMBER: 15099 SAS NUMBER: *** *** *** *** *** *** ***
** ŠTĀTĪŌN ID: SW-Ö5 ** CASE NUMBER: 15099 SAS NUMBER: UG/L ANALYTICAL RESULTS O.050U ALPHA-BHC O.050U BETA-BHC O.050U DELTA-BHC O.050U DELTA-BHC O.050U GAMMA-BHC (LINDANE) O.050U HEPTACHLOR O.050U HEPTACHLOR
** CASE NUMBER: 15099 SAS NUMBER: UG/L ANALYTICAL RESULTS
UG/L ANALYTICAL RESULTS UG/L ANALYTICAL RESULTS UG/L ANALYTICAL RESULTS UG/L ANALYTICAL RESULTS UG/L ANALYTICAL RESULTS UG/L ANALYTICAL RESULTS UG/L ANALYTICAL RESULTS UG/L ANALYTICAL RESULTS UG/L ANALYTICAL RESULTS UG/L ANALYTICAL RESULTS UG/L ANALYTICAL RESULTS UG/L ANALYTICAL RESULTS UG/L ANALYTICAL RESULTS UG/L ANALYTICAL RESULTS UG/L ANALYTICAL RESULTS UG/L ANALYTICAL RESULTS UG/L ANALYTICAL RESULTS O .50U BETHOXYCHLOR ENDRIN KETONE CHLORDANE (TECH. MIXTURE) /1 O .50U GAMMA-BHC (LINDANE) O .50U ALPHA-CHLORDANE /2
UG/L ANALYTICAL RESULTS O.050U ALPHA-BHC O.050U BETA-BHC O.050U DELTA-BHC O.050U DELTA-BHC O.050U GANMA-BHC (LINDANE) O.050U HEPTACHLOR O.050U HEPTACHLOR O.050U HEPTACHLOR O.050U HEPTACHLOR O.050U HEPTACHLOR O.050U ALPHA-CHLORDANE /2
UG/L ANALYTICAL RESULTS UG/L ANALYTICAL RESULTS 0.050U ALPHA-BHC 0.50U METHOXYCHLOR 0.050U BETA-BHC 0.10U ENDRIN KETONE 0.050U DELTA-BHC
0.050U ALPHA-BHC 0.50U METHOXYCHLOR 0.050U BETA-BHC 0.10U ENDRIN KETONE 0.050U DELTA-BHC CHLORDANE (TECH. MIXTURE) /1 0.050U GAMMA-BHC (LINDANE) 0.50U GAMMA-CHLORDANE /2 0.050U HEPTACHLOR 0.50U ALPHA-CHLORDANE /2
0.0500 BETA-BHC 0.100 ENDRÍN KETONE 0.0500 DELTA-BHC CHLORDANE (TECH. MIXTURE) /1 0.0500 GAMMA-BHC (LINDANE) 0.500 GAMMA-CHLORDANE /2 0.0500 HEPTACHLOR 0.500 ALPHA-CHLORDANE /2
0.0500 BETA-BHC 0.100 ENDRÍN KETONE 0.0500 DELTA-BHC CHLORDANE (TECH. MIXTURE) /1 0.0500 GAMMA-BHC (LINDANE) 0.500 GAMMA-CHLORDANE /2 0.0500 HEPTACHLOR 0.500 ALPHA-CHLORDANE /2
O.OSOU DELTA-BHC CHLORDANE (TECH. MIXTURE) /1 O.OSOU GAMMA-BHC (LINDANE) O.SOU GAMMA-CHLORDANE /2 O.OSOU HEPTACHLOR O.SOU ALPHA-CHLORDANE /2
Ö ÖĞÖÜ ĞÂMMA-BHC (LINDANE)
0.050U HEPTACHLOR 0.50U ALPHA-CHLORDANE /2
O OSOU ALDRIN 1.OU TOXAPHENE
O SOU PEPTACHLOR EPOXIDE O SOU PCB-1016 (AROCLOR 1016)
0.050U ENDOSULFAN I (ALPHA) 0.50U PCB-1221 (AROCLOR 1221)
0.10U DIELDRIN 0.50U PCB-1232 (AROCLOR 1232) 0.10U 4.4'-DDE (P.P'-DDE) 0.50U PCB-1242 (AROCLOR 1242)
0.10U 4.4'-DDE (P.P'-DDE) 0.50U PCB-1242 (AROCLOR 1242) 0.10U ENDRIN 0.50U PCB-1248 (AROCLOR 1248)
0.100 ENDRIN
0.10U 4,4' DDD (P,P' DDD)' 1.0U PCB 1260 (AROCLOR 1260)
0.20U ENDOSULFAN SULFATE
0.10U 4,4'-DDT (P,P'-DDT)

REMARKS

REMARKS

FOOTNOTES *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT. *R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION. *C-CONFIRMED BY GCMS 1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD. ATHENS. GA.

01/04/91

DUDGEARI	E ORGANICS DATA	REDORT		C	LOIDI IV L	JD, MIIIL	NJ, UM.				01/04/	91
** PRO ** SOU	JECT NO. 91-025 RCE: AMAX PHOSP TION ID: SW-06	SAMPLE I	* * * * * * NO. 51656 SAN	* * * * * IPLE TYPE:	SURFACEWA	CITY:	* * * * * ELEM: NSF PALMETTO CTION START	COLLECTED	BY: M GORDON ST: FL 1440 STOP): 00/00/00)	**
	E NO.: 15099		S	AS NO :		D. N	O.: Y157					**
UG/L		ANALYTICAL				UG/L	* * * * *	ANALYTIC	AL RESULTS			
100 100 100 200 100 50 50 50 100 100 50	BROMOMETHANE VINYL CHLORID CHLOROETHANE METHYLENE CHL ACETONE CARBON DISULF 1,1-DICHLOROE 1,2-DICHLOROE CHLOROFORM 1,2-DICHLOROE METHYL ETHYL CARBON TETRAC	ORIDE IDE IHENE(1,1-D) IHANE IHENE (TOTAL ITHANE KETONE ROETHANE HLORIDE	ICHLOROETHYLEN	E)		50 50 50 50 50 50 50 50 50 50 50 50 50 5	TRÌCHLÖRÖE DIBROMOCHL 1,1,2-TRIC BENZENE TRANS-1,3- BROMOFORM METHYL SU METHYL BU TETRACHLOR	ICHLOROPROPE THENE (TRICH OROMETHANE CHLOROETHANE DICHLOROPRO DBUTYL KETONE TYL KETONE ROETHENE (TET ETRACHLOROET	ILÖROETHYLENE : : : : : : : : : : : : : : : : : :			

REMARKS

REMARKS

FOOTNOIES

*A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

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01/04/91

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EXTRACTABLE ORGANICS DATA REPORT
PROJECT NO. 91-025 SAMPLE NO. 51656 SAMPLE TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON
. .
    SOURCE: AMAX PHOSPHATE FACIL
                                                                   CITY: PALMETTO
                                                                   CITY: PALMETTO ST: FL
COLLECTION START: 10/17/90 1440 STOP: 00/00/00
    STATION ID: SW-06
                                                                                                                            ..
..
                                                                                                                            * *
  CASE NO.: 15099
                                             SAS NO.:
                                                                    D. NO.: Y157
ANALYTICAL RESULTS
   UG/L
                                                                  UG/L
                                                                                     ANALYTICAL RESULTS
    10U PHENOL
                                                                    50U 3-NITROANILINE
    100 BIS(2-CHLOROETHYL) ETHER
                                                                    100 ACENAPHTHENE
    100 2-CHLOROPHENOL
                                                                    50U 2.4-DINITROPHENOL
    10U 1.3-DICHLOROBENZENE
                                                                    50U 4-NITROPHENOL
    100 1.4-DICHLOROBENZENE
                                                                    10U DIBENZOFURAN
    10U BENZYL ALCOHOL
                                                                    10U 2.4-DINITROTOLUENE
    10U 1,2-DICHLOROBENZENE
                                                                    100 DIETHYL PHTHALATE
    10U 2-METHYLPHENOL
                                                                    10U 4-CHLOROPHENYL PHENYL ETHER
    10U BIS(2-CHLOROISOPROPYL) ETHER
10U (3-AND/OR 4-)METHYLPHENOL
                                                                    10U FLUORENE
                                                                    50U 4-NITROANILINE
                                                                    50U 2-METHYL-4.6-DINITROPHENOL
10U N-NITROSODIPHENYLAMINE/DIPHENYLAMINE
    10U N-NITROSODI-N-PROPYLAMINE
    10U HEXACHLOROETHANE
    100 NITROBENZENE
                                                                    10U 4 BROMOPHENYL PHENYL ETHER
    10U ISOPHORONE
                                                                    10U HEXACHLOROBENZENE (HCB)
    10U 2-NITROPHENOL
                                                                    50U PENTACHLOROPHENOL
    10U 2,4-DIMETHYLPHENOL
                                                                    10U PHENANTHRENE
    SOU BENZOIC ACID
                                                                    tōŭ
                                                                         ANTHRACENE
    10U BIS(2-CHLOROETHOXY) METHANE
10U 2.4-DICHLOROPHENOL
10U 1.2.4-TRICHLOROBENZENE
                                                                        DI-N-BUTYLPHTHALATE
                                                                   10UJ
                                                                        FLUORANTHENE
                                                                    100
                                                                        PYRENE
                                                                    10U
    100 NAPHTHALENE
                                                                        BENZYL BUTYL PHTHALATE
                                                                    100
                                                                        3.3'-DICHLOROBENZIDINE
BENZO(A)ANTHRACENE
    10U 4-CHLOROANILINE
                                                                    20U
    10U HEXACHLOROBUTADIENE
                                                                   10UJ
    10U 4-CHLORO-3-METHYLPHENOL
                                                                    10U
                                                                         CHRYSENE
    10U 2-METHYLNAPHTHALENE
                                                                    400 BIS(2-ETHYLHEXYL) PHTHALATE
    10U HEXACHLOROCYCLOPENTADIENE (HCCP)
                                                                    100 DI-N-OCTYLPHTHALATE
    10U 2.4,6-TRICHLOROPHENOL
50U 2.4,5-TRICHLOROPHENOL
10U 2-CHLORONAPHTHALENE
                                                                         BENZO(B AND/OR K)FLUORANTHENE
                                                                    100
                                                                         BENZO-A-PYRENE
                                                                    100
                                                                        INDENO (1,2,3-CD) PYRENE
DIBENZO(A,H)ANTHRACENE
                                                                    10U
    50U 2-NITROANILINE
                                                                    100
    100 DIMETHYL PHTHALATE
                                                                    100
                                                                        BENZO(GHI)PÉRYLENE
    10U ACENAPHTHYLENE
    10U 2.6-DINITROTOLUENE
```

REMARKS

REMARKS

^{*}NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

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SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD, ATHENS, GA.

01/04/91

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* *

MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT

PROJECT NO. 91-025 SAMPLE NO. 51656 SAMPLE TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON ..

SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO ST: FL

COLLECTION START: 10/17/90 1440 STOP: 00/00/00 STATION ID: SW-06 .. MD NO: Y157 CASE.NO .: 15099 ** D. NO.: Y157

** * *

ANALYTICAL RESULTS UG/L

1003 3 UNIDENTIFIED COMPOUNDS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

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SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD, ATHENS, GA.

01/04/91

PESTICIDES/PCB'S DATA REPORT	
PROJECT NO. 91-025 SAMPLE NO. 51656 SAMPLE TYPE: SURFACEWA SOURCE: AMAX PHOSPHATE FACIL STATION ID: SW-06	PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1440 STOP: 00/00/00 P. NUMBER: Y157
UG/L ANALYTICAL RESULTS	UG/L ANALYTICAL RESULTS
O.050U ALPHA-BHC O.050U BETA-BHC O.050U DELTA-BHC O.050U GAMMA-BHC (LINDANE) O.050U HEPTACHLOR O.050U ALDRIN O.050U HEPTACHLOR EPOXIDE O.050U ENDOSULFAN I (ALPHA) O.10U DIELDRIN O.10U DIELDRIN O.10U ENDRIN O.10U ENDRIN O.10U ENDOSULFAN II (BETA) O.10U 4.4'-DDE (P.P'-DDE) O.10U 4.4'DDD (P.P'-DDD) O.10U 4.4'DDD (P.P'-DDD) O.10U ENDOSULFAN SULFATE O.10U 4.4'-DDT (P.P'-DDT)	0.50U METHOXYCHLOR 0.10U ENDRIN KETONE CHLORDANE (TECH. MIXTURE) /1 0.50U GAMMA-CHLORDANE /2 0.50U ALPHA-CHLORDANE /2 1.0U TOXAPHENE 0.50U PCB-1016 (AROCLOR 1016) 0.50U PCB-1221 (AROCLOR 1221) 0.50U PCB-1232 (AROCLOR 1232) 0.50U PCB-1242 (AROCLOR 1242) 0.50U PCB-1248 (AROCLOR 1242) 1.0U PCB-1254 (AROCLOR 1254) 1.0U PCB 1260 (AROCLOR 1260)

REMARKS

REMARKS

^{***}FOOTNOTES*** *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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*C-CONFIRMED BY GCMS
1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD. ATHENS. GA.

01/04/91

PURGEABLE ORGANICS DATA REPORT	5.,6.,5.
	* * * * * * * * * * * * * * * * * * * *
** PROJECT NO. 91-025 SAMPLE NO. 51654 SAMPLE TYPE: SURFACEWA	
SOURCE: AMAX PHOSPHATE FACIL	CITY: PALMETTO ST: FL **
** STATION ID: SW-07	COLLECTION START: 10/17/90 1515 STOP: 00/00/00 **
**	D. NO V4C4
** CASE NO.: 15099 SAS NO.:	. D. NO.: Y161 ** * * * * * * * * * * * * * * * * *
UG/L ANALYTICAL RESULTS	UG/L ANALYTICAL RESULTS
Va/E	ANALTHUAL RESULTS
10U CHLOROMETHANE	5U 1,2-DICHLOROPROPANE
10U BROMOMETHANE	50 CIS-1.3-DICHLOROPROPENE
10U VINYL CHLORIDE	5U TRICHLOROETHENE(TRICHLOROETHYLENE)
10U CHLOROETHANE	5U DIBROMOCHLOROMETHANE
<u> ŞOU METHYLENE CHLORIDE</u>	5U 1,1,2-TRICHLOROETHANE
10U ACETONE	5U BENZENE
SU CARBON DISULFIDE	5U TRANS-1,3-DICHLOROPROPENE
5U 1,1-DICHLOROETHENE(1,1-DICHLOROETHYLENE) 5U 1,1-DICHLOROETHANE	5U BROMOFORM 10U METHYL ISOBUTYL KETONE
5U 1,2-DICHLOROETHENE (TOTAL)	10U METHYL ISOBUTYL KETONE 10U METHYL BUTYL KETONE
5U CHLOROFORM	5U TETRACHLOROETHENE (TETRACHLOROETHYLENE)
5U 1,2-DICHLOROETHANE	5U 1,1,2,2-TETRACHLOROETHANE
10UR MÉTILYL ETILYL KETÖNE	SU TOLUENE
SU 1,1,1-TRICHLORGETHANE	5Ú ĆHLOROBENZENE
5U CÁRBON TÉTRACHLORIDE	5U ETHYL BENZENE
10U VINYL_ACETATE	5U STYRENE
5U BROMODICHLOROMETHANE	5U TOTAL XYLENES

REMARKS

REMARKS

FOOTNOTES

*A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN

*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

01/04/91

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EXTRACTABLE ORGANICS DATA REPORT
PROJECT NO. 91-025 SAMPLE NO. 51654 SAMPLE TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON
    SOURCE: AMAX PHOSPHATE FACIL
                                                                   CITY: PALMETTO
**
                                                                                              ST: FL
                                                                                                                            * *
    STATION ID: SW-07
                                                                   COLLECTION START: 10/17/90 1515 STOP: 00/00/00
..
                                                                                                                            * *
..
                                                                                                                            ..
   CASE NO.: 15099
                                             SAS NO.:
                                                                    D. NO.: Y161
..
                                                                                                                            .
   ANALYTICAL RESULTS
                                                                  UG/L
   UG/L
                                                                                     ANALYTICAL RESULTS
                                                                    50U 3-NITROANILINE
    10U PHENOL
    100 BIS(2-CHLOROETHYL) ETHER
100 2-CHLOROPHENOL
                                                                    100
                                                                         ACENAPHTHENE
                                                                        2.4-DINITROPHENOL
4-NITROPHENOL
                                                                    50U
         1,3-DICHLOROBENZENE
                                                                    50U
    100
    100 1.4-DICHLOROBENZENE
                                                                    100
                                                                         DIBENZOFURAN
                                                                        2.4-DINITROTOLUENE
    100 BENZYL ALCOHOL
                                                                    100
        1.2-DICHLOROBENZENE
    100
                                                                    10U DIETHYL PHTHALATE
    10U 2-METHYLPHENOL
                                                                    100
                                                                         4-CHLOROPHENYL PHENYL ETHER
    100 BIS(2-CHLOROISOPROPYL) ETHER
                                                                        FLUORENE
                                                                    100
                                                                    50Ŭ
50U
    100
         (3-AND/OR 4-)METHYLPHENOL
                                                                         4-NITROANILINE
                                                                        2-METHYL-4.6-DINITROPHENOL
N-NITROSODIPHENYLAMINE/DIPHENYLAMINE
    10U N-NITROSODI-N-PROPYLAMINE
         HEXACHLOROETHANE
                                                                    100
    100
         NITROBENZENE
                                                                         4-BROMOPHENYL PHENYL ETHER
    100
                                                                    100
         ISOPHORONE
                                                                        HEXACHLOROBENZENE (HCB)
    100
                                                                    100
        2-NITROPHENOL
                                                                         PENTACHLOROPHENOL
    100
                                                                    50U
         2.4-DIMETHYLPHENOL
                                                                    100
                                                                         PHENANTHRENE
    100
        BENZOIC ACID
    50U
                                                                    100
                                                                         ANTHRACENE
        BIS(2-CHLOROETHOXY) METHANE
                                                                   10ŬĴ
                                                                        DI-N-BUTYLPHTHALATE
    10U 2.4-DICHLOROPHENOL
10U 1.2.4-TRICHLOROBENZENE
                                                                    100
                                                                         FLUORANTHENE
                                                                    100
                                                                         PYRENE
    100 NAPHTHALENE
                                                                    100
                                                                         BENZYL BUTYL PHTHALATE
                                                                         3.3'-DICHLOROBENZIDINE
BENZO(A)ANTHRACENE
    10U 4-CHLOROANILINE
                                                                    20U
    10U HEXACHLOROBUTADIENE
                                                                   10UJ
        4-CHLORO-3-METHYLPHENOL
                                                                         CHRYSÈNÉ
    10U
                                                                    100
         2-METHYLNAPHTHALENE
                                                                         BIS(2-ETHYLHEXYL) PHTHALATE
    100
                                                                    100
                                                                        DI-N-OCTYLPHTHALATE
BENZO(B AND/OR K)FLUORANTHENE
        HEXACHLOROCYCLOPENTADIENE (HCCP)
    100
                                                                    100
    10U 2,4.6-TRICHLOROPHENOL
50U 2,4,5-TRICHLOROPHENOL
                                                                    100
                                                                         BENZO-A-PYRENE
                                                                    10U INDENO (1,2,3-CD) PYRENE
10U DIBENZO(A,H)ANTHRACENE
    10U 2-CHLORONAPHTHALENE
    50U 2-NITROANILINE
    100 DIMETHYL PHTHALATE
100 ACENAPHTHYLENE
                                                                        BENZO(GHI)PERYLENE
        2.6-DINITROTOLUENE
    10U
```

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT. *R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD. ATHENS. GA.

01/04/91

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PESTICIDES/PCB'S DATA REPORT
PROJECT NO. 91-025
                     SAMPLE NO. 51654 SAMPLE TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON
                                                                                                                * *
    SOURCE: AMAX PHOSPHATE FACIL
                                                            CITY: PALMETTO ST: FL
COLLECTION START: 10/17/90 1515 STOP: 00/00/00
                                                                                                                . .
..
    STATION ID: SW-07
..
                                                                                                                • •
                            SAS NUMBER:
    CASE NUMBER: 15099
                                                             D. NUMBER: Y161
**
                                                                                                                ..
**
                                                                                                                **
   ...
                    ANALYTICAL RESULTS
                                                             UG/L
   UG/L
                                                                              ANALYTICAL RESULTS
 0.050U ALPHA-BHC
                                                            O. SOU METHOXYCHLOR
                                                            0.100
 0.050U BETA-BHC
                                                                  ENDRIN KETONE
 0.0500 DELTA-BHC
                                                                  CHLORDANE (TECH. MIXTURE) /1
        GAMMA-BHC (LINDANE)
 0.0500
                                                            0.500
                                                                  GAMMA-CHLORDANE
 0.0500
        HEPTACHLOR
                                                            0.500
                                                                  ALPHA-CHLORDANE
 0.0500
        ALDRIN
                                                             1.00
                                                                  TOXAPHENE
                                                                  PCB-1016 (AROCLOR 1016)
PCB-1221 (AROCLOR 1221)
 0.0500
        HEPTACHLOR EPOXIDE
                                                            0.500
 0.0500
        ENDOSULFAN I (ALPHA)
                                                            0.500
  0.100
        DIELDRIN
                                                            0.500
                                                                  PCB-1232 (AROCLOR 1232)
PCB-1242 (AROCLOR 1242)
  0.10U 4.4'-DDE (P.P'-DDE)
                                                            0.500
  O 100 ENDRIN
                                                            0.50U
                                                                  PCB-1248 (AROCLOR 1248)
  0.10U ENDOSULFAN II (BETA)
0.10U 4,4' DDD (P,P' DDD)
                                                             1.00
                                                                  PCB-1254 (AROCLOR 1254)
                                                                  PCB 1260 (AROCLOR 1260)
                                                             1.0U
  O. 10U ENDOSULFAN SULFATE
  0.10U 4.4'-DDT (P.P'-DDT)
```

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *NA~NOT ANALYZED

^{**}A-AVERAGE VALUE "**NATION ANALYZED THE "*NATION TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

*C-CONFIRMED BY GCMS 1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD. ATHENS, GA.

GION IV ESD. ATHENS. GA. 01/04/91

DHD	GEABLE ORGANICS DATA REPORT	SU, ATHENS, GA.	01/04/91
	* * * * * * * * * * * * * * * * * * *		
**	PROJECT NO. 91-025 SAMPLE NO. 51647 SAMPLE TYPE: SURFACEWA		
**	SOURCE: AMAX PHOSPHATE FACIL	CITY: PALMETTO ST: FL	• •
• •	STATION ID: SW-08	COLLECTION START: 10/17/90 1605 STOP	: 00/00/00
**	0.055 NO - 45000		**
**	CASE NO.: 15099 SAS NO.:	D. NO.: Y165	**
•••	UG/L ANALYTICAL RESULTS	UG/L ANALYTICAL RESULTS	* * * * * * * * * * * * * * * * * * * *
	10U CHLOROMETHANE	5U 1.2-DICHLOROPROPANE	
	10U BROMOMETHANE	5U CIS-1,3-DICHLOROPROPENE	
	10U VINYL CHLORIDE	5U TRICHLOROETHENE (TRICHLOROETHYLENE)
	10U CHLOROETHANE 30U METHYLENE CHLORIDE	5U DIBROMOCHLOROMETHANE	
	30U METHYLENE CHLORIDE 20U ACETONE	5U 1.1.2-TRICHLOROETHANE 5U BENZENE	
	5U CARBON DISULFIDE	5U TRANS-1,3-DICHLOROPROPENE	
	5U 1,1-DICHLOROETHENE(1,1-DICHLOROETHYLENE)	5U BROMOFORM	
	5U 1,1-DICHLOROETHANE	10U METHYL ISOBUTYL KETONE	
	50 1,2-DICHLOROETHENE (TOTAL)	100 METHYL BUTYL KETONE	
	5U CHLOROFORM 5U 1.2-DICHLOROETHANE	5U TETRACHLOROETHENE (TETRACHLOROETHY	LENE)
	10UR METHYL ETHYL KETONE	5U 1,1,2,2-TETRACHLOROETHANE 5U TOLUENE	
	5U 1,1,1-TRICHLOROETHANE	50 TOLOENE 50 CHLOROBENZENE	
	ŠŲ ČÁŘBON TĒTRĀCHLORĪDE	5U ETHYL BENZENE	
	10U VINYL ACETATE	5U STYRENE	
	5U BROMODICHLOROMETHANE	SU TOTAL XYLENES	

REMARKS

REMARKS

FOOTNOTES

*A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

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EXTRACTABLE ORGANICS DATA REPORT
PROG ELEM: NSF COLLECTED BY: M GORDON
    PROJECT NO. 91-025 SAMPLE NO. 51647 SAMPLE TYPE: SURFACEWA
                                                                                                                            ..
    SOURCE: AMAX PHOSPHATE FACIL
                                                                   CITY: PALMETTO
                                                                                             ST: FL
    STATION ID: SW-08
                                                                   COLLECTION START: 10/17/90 1605 STOP: 00/00/00
..
                                                                                                                             **
                                                                                                                            **
                                             SAS NO.:
   CASE NO.: 15099
                                                                    D. NO.: Y165
                                                                                                                            ..
   UG/L
                      ANALYTICAL RESULTS
                                                                  UG/L
                                                                                      ANALYTICAL RESULTS
    10U PHENOL
                                                                    50U 3-NITROANILINE
    10U BIS(2-CHLOROETHYL) ETHER
                                                                    10U ACENAPHTHENE
    10U 2-CHLOROPHENOL
                                                                    50U 2.4-DINITROPHENOL
    10U 1.3-DICHLOROBENZENE
                                                                    500 4-NITROPHENOL
    100 1.4-DICHLOROBENZENE
                                                                    10U DIBENZOFURAN
    10U BÉNZYL ALCOHOL
10U 1,2-DICHLOROBENZENE
10U 2-METHYLPHENOL
                                                                    100 2.4-DINITROTOLUENE
100 DIETHYL PHTHALATE
                                                                    10U 4-CHLOROPHENYL PHENYL ETHER
     100 BIS(2-CHLOROISOPROPYL) ETHER
                                                                    100 FLUORENE
    10U (3-AND/OR 4-)METHYLPHÉNOL
10U N-NITROSODI-N-PROPYLAMINE
                                                                    50U 4-NITROANILINE
                                                                    50U 2-METHYL-4.6-DINITROPHENOL
10U N-NITROSODIPHENYLAMINE/DIPHENYLAMINE
    10U HEXACHLOROETHANE
    10U NITROBENZENE
                                                                    10U 4 BROMOPHENYL PHENYL ETHER
    100 ISOPHORONE
                                                                    100 HEXACHLOROBENZENE (HCB)
    10U 2-NITROPHENOL
10U 2.4-DIMETHYLPHENOL
50U BENZOIC ACID
                                                                    50U PENTACHLOROPHENOL
                                                                    10U PHENANTHRENE
                                                                        ANTHRACENE
                                                                    10U
    100
        BIS(2-CHLOROETHOXY) METHANE
                                                                   10UJ DI-N-BUTYLPHTHALATE
    10U 2,4-DICHLOROPHENOL
                                                                    100 FLUORANTHENE
    10U 1.2.4-TRICHLOROBENZENE
                                                                    10U PYRENE
    100 NAPHTHALENE
                                                                    10U BENZYL BUTYL PHTHALATE
    10U 4-CHLOROANILINE
                                                                    20U 3.3'-DICHLOROBENZIDINE
    10U HEXACHLOROBUTADIENE
                                                                   10UJ BENZO(A)ANTHRACENE
    10U 4-CHLORO-3-METHYLPHENOL
10U 2-METHYLNAPHTHALENE
                                                                    10U CHRYSËNË
                                                                    10U
                                                                         BIS(2-ETHYLHEXYL) PHTHALATE
                                                                        DI-N-OCTYLPHTHALATE
BENZO(B AND/OR K)FLUORANTHENE
    10U HEXACHLOROCYCLOPENTADIENE (HCCP)
                                                                    100
    10U 2.4.6-TRICHLOROPHENOL
50U 2.4.5-TRICHLOROPHENOL
                                                                    100
                                                                    10U BENZO-A-PYRENE
    10U 2-CHLORONAPHTHALENE
                                                                        INDENO (1,2,3-CD) PYRENE
                                                                    100
    50U 2-NITROANILINE
                                                                        DIBENZO(A,H)ANTHRACENE
                                                                    100
    100 DIMETHYL PHTHALATE
                                                                    100
                                                                         BENZO(GHI)PERYLENE
    10U ACENAPHTHYLENE
    10U 2,6-DINITROTOLUENE
```

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT. *R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD. ATHENS. GA.

01/04/91

PESTICIDES/PCB'S /DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51647 SAMPLE TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO .. ST: FL COLLECTION START: 10/17/90 1605 STOP: 00/00/00 STATION ID: SW-08 D. NUMBER: Y165 CASE NUMBER: 15099 SAS NUMBER: UG/L ANALYTICAL RESULTS UG/L ANALYTICAL RESULTS 0.050U ALPHA-BHC 0.500 METHOXYCHLOR O 100 ENDRIN KETONE O. OSOU BETA-BHC CHLORDANE (TECH. MIXTURE) /1 0.050U DELTA-BHC 0.050U GAMMA-BHC (LINDANE) O.50U GAMMA-CHLORDANE 0.050U HEPTACHLOR 0.500 ALPHA-CHLORDANE O. OSOU ALDRIN 1.00 TOXAPHENE 0.500 PCB-1016 (AROCLOR 1016) PCB-1221 (AROCLOR 1221) HEPTACHLOR EPOXIDE 0.0500 ENDOSULFAN I (ALPHA) 0.500 0.0500 DIELDRIN 0.500 PCB-1232 (AROCLOR 1232) 0.100 4.4'-DDE (P,P'-DDE) 0.500 PCB-1242 (AROCLOR 1242) 0.100 O. 10U ENDRIN 0.50U PCB-1248 (AROCLOR 1248) O. 10U ENDOSULFAN II (BETA) 1.00 PCB-1254 (AROCLOR 1254) 0.10U 4,4' DDD (P,P' DDD) 1 OU PCB 1260 (AROCLOR 1260) 0.200 ENDOSULFAN SULFATE 0.10U 4.4'-DDT (P.P'-DDT)

REMARKS

REMARKS

FOOTNOTES *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *A-AVERAGE VALUE

^{*}K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.
*C-CONFIRMED BY GCMS

1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD. ATHENS. GA.

01/04/91

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* *

MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT

PROJECT NO. 91-025 SAMPLE NO. 51647 SAMPLE TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO .. ST: FL COLLECTION START: 10/17/90 1605 STOP: 00/00/00 STATION ID: SW-08 **

.. CASE.NO.: 15099 SAS NO.: D. NO.: Y165 MD NO: Y165 .. ** . .

ANALYTICAL RESULTS UG/L

4JN BROMACIL

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN

^{*}U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

[•]R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

PHR	SFARI F	ORGANICS DA	TA REPORT		LFM-I	VEGTOR IA C	SU, AINL	.NJ, UM.				01/04/91
**	PROJ SOUR	ECT NO. 91-0	25 SAMPLE SPHATE FACIL	NO. 51651 S			PROG CITY:	ELEM: NSF PALMETTO	COLLECTED	BY: M GORDON ST: FL 1515 STOP:		**
***		NO.: 15099	* * * * * * * ANALYTICA	L RESULTS	SAS NO.:		D. N UG/L	Ю.: Y163		AL RESULTS	• • • • •	* * * * * ***
	100 100 100 500 500 50 50 50 50 50 100 50	1,1-DICHLOR	E IDE E HLORIDE LFIDE OETHENE (1.1-1 OETHANE OETHANE L KETONE LOROETHANE ACHLORIDE TE	DICHLOROETHYL AL)	ENE)			CÍS-1,3-D TRICHLORO DIBROMOCHI 1,1,2-TRI BENZENE TRANS-1,3 BROMOFORM METHYL BU TETRACHLO	ICHLOROPROPE ETHENE (TRICH LOROMETHANE CHLOROETHANE -DICHLOROPRO DBUTYL KETON TYL KETONE ROETHENE (TET ETRACHLOROETI ZENE	LÖROETHYLENE) PENE E RACHLOROETHYL		

REMARKS

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REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

01/04/91

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EXTRACTABLE ORGANICS DATA REPORT
** PROJECT NO. 91-025 SAMPLE NO. 51651 SAMPLE TYPE: SURFACEWA

** SOURCE: AMAX PHOSPHATE FACIL

** STATION ID: SW-09

** COLLECTION START: 10/17/90 1515 STOP: 00/00/00
                                                                                                                                           . .
                                                                                                                                           ..
                                                                            D. NO.: Y163
   CASE NO.: 15099
                                                  SAS NO.:
ANALYTICAL RESULTS
    UG/L
                                                                          UG/L
                                                                                                ANALYTICAL RESULTS
     10U PHENOL
                                                                            50U 3-NITROANILINE
     100 BIS(2-CHLOROETHYL) ETHER
                                                                            100 ACENAPHTHENE
     100 2-CHLOROPHENOL
                                                                            50U 2.4-DINITROPHENOL
     100 1.3-DICHLOROBENZENE
100 1.4-DICHLOROBENZENE
                                                                            500 4-NITROPHENOL
                                                                            10U DIBENZOFURAN
     100 BENZYL ALCOHOL
100 1,2-DICHLOROBENZENE
                                                                            100
                                                                                 2.4-DINITROTOLUENE
                                                                            100 DIETHYL PHTHALATE
     10U 2-METHYLPHENOL
                                                                            100
                                                                                 4-CHLOROPHENYL PHENYL ETHER
     10U BIS(2-CHLOROISOPROPYL) ETHER
                                                                            100 FLUORENE
     10U (3-AND/OR 4-)METHYLPHENOL
                                                                            50U 4-NITROANILINE
     10U N-NITROSODI-N-PROPYLAMINE
                                                                            50U
                                                                                 2-METHYL-4,6-DINITROPHENOL
     100
          HEXACHLOROETHANE
                                                                                 N-NITROSODIPHENYLAMINE/DIPHENYLAMINE
                                                                            100
                                                                                 4 BROMOPHENYL PHENYL ETHER
     100
          NITROBENZENE
                                                                            100
         1SOPHORONE
2-NITROPHENOL
2,4-DIMETHYLPHENOL
     100
                                                                            100
                                                                                 HEXACHLOROBENZENE (HCB)
                                                                                 PENTACHLOROPHENOL
     100
                                                                            50U
                                                                                 PHENANTHRENE
     100
                                                                            100
     SOU BENZOIC ACID
                                                                            100
                                                                                  ANTHRACENE
     10U BIS(2-CHLOROETHOXY) METHANE
10U 2,4-DICHLOROPHENOL
10U 1,2,4-TRICHLOROBENZENE
                                                                                 DI-N-BUTYLPHTHALATE
                                                                           10UJ
                                                                            100
                                                                                 FLUORANTHENE
                                                                            100
                                                                                 PYRENE
     100 NAPHTHALENE
                                                                            100 BENZYL BUTYL PHTHALATE
          4-CHLOROANILINE
     100
                                                                            20U
                                                                                 3,3'-DICHLOROBENZIDINE
          HEXACHLOROBUTADIENE
4-CHLORO-3-METHYLPHENOL
                                                                                 BENZO(A)ANTHRACENE
     100
                                                                           100J
                                                                            10U
                                                                                 CHRYSENE
                                                                                 BIS(2-ETHYLHEXYL) PHTHALATE
DI-N-OCTYLPHTHALATE
          2-METHYLNAPHTHALENE
     100
                                                                            100
     100 HEXACHLOROCYCLOPENTADIENE (HCCP)
100 2.4.6-TRICHLOROPHENOL
                                                                            100
                                                                            100
                                                                                 BENZO(B AND/OR K)FLUORANTHENE
     50U 2.4.5-TRICHLOROPHENOL
                                                                            100 BENZO-A-PYRENE
     10U 2-CHLORONAPHIHALENE
                                                                            10U INDENO (1,2,3-CD) PYRENE
10U DIBENZO(A,H)ANTHRACENE
     50U 2-NITROANILINE
     100 DIMETHYL PHTHALATE
100 ACENAPHTHYLENE
                                                                            10U BENZO(GHI)PERYLENE
     10U 2.6-DINITROTOLUENE
```

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD. ATHENS. GA.

01/04/91

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MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT

PROJECT NO. 91-025 SAMPLE NO. 51651 SAMPLE TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON . .

SOURCE: AMAX PHOSPHATE FACIL STATION ID: SW-09

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CASE.NO.: 15099 SAS NO.:

CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1515 STOP: 00/00/00

D. NO.: Y163

MD NO: Y163

* *

ANALYTICAL RESULTS UG/L

10JN HEXADECANOIC ACID **HYDROXYMETHOXYBENZALDEHYDE** 5JN **60**J 4 UNIDENTIFIED COMPOUNDS PETROLEUM PRODUCT

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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SAMPLE AND ANALYSIS MANAGEMENT SYSTEM

EPA-REGION IV ESD, ATHENS, GA. 01/04/91

DECTIONES (DCB/C DATA DEDODT	EFA-REGION IN ESU, MINENS, GA.	01/04/91
PESTICIDES/PCB'S DATA REPORT		
PROJECT NO. 91-025 SAMPLE NO. 51651 SAMPLE SOURCE: AMAX PHOSPHATE FACIL STATION ID: SW-09 CASE NUMBER: 15099 SAS NUMBER:		* * * ** ** ** **
UG/L ANALYTICAL RESULTS	UG/L ANALYTICAL RESULTS	
O.OSOU ALPHA-BHC O.OSOU BETA-BHC O.OSOU DELTA-BHC O.OSOU GAMMA-BHC (LINDANE) O.OSOU HEPTACHLOR O.OSOU ALDRIN O.OSOU HEPTACHLOR EPOXIDE O.OSOU ENDOSULFAN I (ALPHA) O.1OU DIELDRIN O.1OU DIELDRIN O.1OU ENDRIN O.1OU ENDOSULFAN II (BETA) O.1OU ENDOSULFAN II (BETA) O.1OU ENDOSULFAN II (BETA) O.1OU ENDOSULFAN SULFATE O.1OU 4.4'-DDD (P.P'-DDD) O.1OU 4.4'-DDD (P.P'-DDD) O.1OU 4.4'-DDT (P.P'-DDT)	0.50U METHOXYCHLOR 0.10U ENDRIN KETONE CHLORDANE (TECH. MIXTURE) /1 0.50U GAMMA-CHLORDANE /2 0.50U ALPHA-CHLORDANE /2 1.0U TOXAPHENE 0.50U PCB-1016 (AROCLOR 1016) 0.50U PCB-1221 (AROCLOR 1221) 0.50U PCB-1232 (AROCLOR 1232) 0.50U PCB-1242 (AROCLOR 1242) 0.50U PCB-1248 (AROCLOR 1248) 1.0U PCB-1254 (AROCLOR 1254) 1.0U PCB-1260 (AROCLOR 1260)	

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.
*C-CONFIRMED BY GCMS 1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD, ATHENS, GA.

01/04/91

DHD	GEABLE ORGANICS DATA REPORT	JD, ATREAS, QA.	01/04/91
***	PROJECT NO. 91-025 SAMPLE NO. 51650 SAMPLE TYPE: SURFACEWA SOURCE: AMAX PHOSPHATE FACIL		* * * * * * * * * * * * * * * * * * * *
**	STATION ID: SW-11	COLLECTION START: 10/17/90 1445 STOP:	
**	CASE NO.: 15099 SAS NO.:	D. NO.: Y158	
***	UG/L ANALYTICAL RESULTS	UG/L ANALYTICAL RESULTS	• • • • • • • • • • • • • • • • • • • •
	10U CHLOROMETHANE 10U BROMOMETHANE	5U 1,2-DICHLOROPROPANE 5U CIS-1,3-DICHLOROPROPENE	
	10U VINYL CHLORIDE	5U TRICHLOROETHENE (TRICHLOROETHYLENE)	
	10U CHLOROETHANE	5U DIBROMOCHLOROMETHANE	
	70U METHYLENE CHLORIDE 30U ACETONE	5U 1,1,2-TRICHLOROETHANE 5U BENZENE	
	4J CARBON DISULFIDE	5U TRANS-1,3-DICHLOROPROPENE	
	5U 1,1-DICHLOROETHENE(1,1-DICHLOROETHYLENE)	5U BROMOFORM	
	5U 1,1-DICHLOROETHANE 5U 1.2-DICHLOROETHENE (TOTAL)	10U METHYL ISOBUTYL KETONE 10U METHYL BUTYL KETONE	
	SU CHLOROFORM	5U TETRACHLOROETHENE (TETRACHLOROETHYLE	NE)
	5U 1,2-DICHLOROETHANE	5U 1,1,2,2-TETRACHLOROETHANE	
	10UR MÉTHYL ETHYL KETONE 5U 1.1.1-TRICHLOROETHANE	5U TOLUENE 5U CHLOROBENZENE	
	SŨ CĂRBON TĒTRĀCHLORIDĒ	SÚ ETHÝL BENZENE	
	10U VINYL ACETATE	5U STYRENE	
	5U BROMODICHLOROMETHANE	5U TOTAL XYLENES	

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD, ATHENS, GA.

01/04/91

MISCELLANEOUS PURGEABLE ORGANICS - DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51650 SAMPLE TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON .. SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1445 STOP: 00/00/00 CITY: PALMETTO STATION ID: SW-11 .. CASE NO.: 15099 SAS NO.: MD NO: Y158 .. D. NO.: Y158 **

ANALYTICAL RESULTS UG/L

SJN **TETRAMETHYLBUTANE**

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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EPA-REGION IV ESD, ATHENS, GA. 01/04/91

	ST: FL 1445 STOP: 00/00/00
CASE NO.: 15099 SAS NO.: D. NO.: Y158 UG/L ANALYTICAL RESULTS UG/L ANALYTICAL	**
10U PHENOL 10U ACENAPHTHENE 10U ACHIOROPHENOL ACENAPHTHENE ACENAP	PHENOL NE/DIPHENYLAMINE ETHER CB) TE NE THALATE DRANTHENE RENE

REMARKS

REMARKS

^{***}FOOTNOTES***

*A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

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SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD. ATHENS. GA.

01/04/91

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MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT

PROJECT NO. 91-025 SAMPLE NO. 51650 SAMPLE TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON ST: FL

SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO STATION ID: SW-11

COLLECTION START: 10/17/90 1445 STOP: 00/00/00

CASE NO : 15099 SAS NO : D. NO.: Y158 MD NO: Y158

ANALYTICAL RESULTS UG/L

7JN TETRADECANOIC ACID 10JN HEXADECANOIC ACID

FOOTNOTES

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SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD, ATHENS, GA.

01/04/01

PESTICIDES/PCB'S DATA REPORT	EFA REGION IV ESD, MITTENS, GA.	01/04/91
** PROJECT NO. 91-025 SAMPLE NO. 51650 SAMPLE ** SOURCE: AMAX PHOSPHATE FACIL ** STATION ID: SW-11 ** CASE NUMBER: 15099 SAS NUMBER: **	TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON	**
UG/L ANALYTICAL RESULTS	UG/L ANALYTICAL RESULTS	• • • • • • • • • • • • • • • • • • • •
UG/L ANALYTICAL RESULTS 0.050U ALPHA-BHC 0.050U BETA-BHC 0.050U DELTA-BHC 0.050U GAMMA-BHC (LINDANE) 0.050U HEPTACHLOR 0.050U ALDRIN 0.050U HEPTACHLOR EPOXIDE 0.050U ENDOSULFAN I (ALPHA) 0.10U DIELDRIN 0.10U DIELDRIN 0.10U ENDOSULFAN II (BETA) 0.10U ENDOSULFAN II (BETA) 0.10U ENDOSULFAN II (BETA) 0.10U 4.4'-DDD (P.P'-DDD) 0.60U ENDOSULFAN SULFATE 0.10U 4.4'-DDT (P.P'-DDT)	O.50U METHOXYCHLOR O.10U ENDRIN KETONE CHLORDANE (TECH. MIXTURE) /1 O.50U GAMMA-CHLORDANE /2 O.50U ALPHA-CHLORDANE /2 1.0U TOXAPHENE O.50U PCB-1016 (AROCLOR 1016) O.50U PCB-1221 (AROCLOR 1221) O.50U PCB-1232 (AROCLOR 1232) O.50U PCB-1242 (AROCLOR 1242) O.50U PCB-1248 (AROCLOR 1248) 1.0U PCB-1254 (AROCLOR 1254) 1.0U PCB-1260 (AROCLOR 1260)	

REMARKS

REMARKS

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*C-CONFIRMED BY GCMS
1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD. ATHENS, GA.

ON IV ESD. ATHENS, GA. 01/04/91

PURGEABLE	ORGANICS DATA	REPORT								• •
*** * * *	FOT NO 01 00F	* * * * * * * * * * * * * * * * * * *	# # # # # # # # # # # # # # # # # # #	* * * * * *		* * * * * * *		* * * * * * *		* * * ***
	JECT NO. 91-025 RCE: AMAX PHOSPI		. 51683 SAMPLE TYPE	: GROUNDWA		ELEM: NSF PALMETTO	COLLECTED E	BY: M GORDON ST: FL		**
	TION ID: TW-01	MAIL TACIL			COLLE	CTION START:			00/00/00	**
**	10A 10. 1W 01				COLLE	CITON SIANI.	10/10/30	1025 STUP.	00/00/00	**
	NO.: 15099		SAS NO.:		D. N	O.: Y142				**
*** * * *										* * * ***
UG/L		ANALYTICAL RE	ESULTS		UG/L		ANALYTICA	L RESULTS		
4011	CUI ODOMETIJANE				511	4 0 DICH OF	ODDODANE			
10U 10U	CHLOROMETHANE BROMOMETHANE					1.2-DICHLOF		16		
100	VINYL CHLORID	F			50 50			OROETHYLENE)		
100	CHLOROETHANE	-			SŬ	DIBROMOCHLO		ONOL MITELIAL)		
ΘŬ	METHYLENE CHL	ORIDE			ŠŬ	1.1.2-TRICH				
100	ACETONE				50	BENZENE				
50	CARBON DISULF				50		DICHLOROPROP	PENE		
50			HLOROETHYLENE)		,5U	BROMOFORM				
<u>50</u>	1.1-DICHLOROE				100	METHYL ISOE				
ຼັວບ	1,2-DICHLOROE	THENE (TOTAL)	•		100	METHYL BUTY		ACIII ODOETUVI E	-NE \	
50 50	CHLOROFORM 1.2-DICHLOROE	THANE			50 50		RACHLOROETH	RACHLOROETHYLE	INE)	
100	METHYL ETHYL I				50 50	TÓLÚĒNĒ	MACHEOROE I	IMML		
50	1.1.1-TRICHLO				50 50	CHLOROBENZE	NF			
ŠŬ	CARBON TETRACI				ŠŬ	ETHYL BENZE				
100	VINYL ACETATE				50	STYRENE				
50	BROMODICHLORO	ME THANE			50	TOTAL XYLEN	IES			

REMARKS

REMARKS

FOOTNOTES

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01/04/91

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EXTRACTABLE ORGANICS DATA REPORT
PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL
    PROJECT NO. 91-025 SAMPLE NO. 51683 SAMPLE TYPE: GROUNDWA
     SOURCE: AMAX PHOSPHATE FACIL
                                                                                           ST: FL
                                                                                                                                        * *
                                                                         COLLECTION START: 10/16/90 1625 STOP: 00/00/00
     STATION ID: TW-01
                                                                                                                                        ..
                                                                                                                                        **
   CASE NO.: 15099
                                                 SAS NO.:
                                                                          D. NO.: Y142
                                                                                                                                        * *
ANALYTICAL RESULTS
                                                                        UG/L
    UG/L
                                                                                             ANALYTICAL RESULTS
     10U PHENOL
                                                                           50U 3-NITROANILINE
     100 BIS(2-CHLOROETHYL) ETHER
100 2-CHLOROPHENOL
                                                                           10U ACENAPHTHENE
                                                                           50U 2,4-DINITROPHENOL
50U 4-NITROPHENOL
         1,3-DICHLOROBENZENE
     10U
     100 1.4-DICHLOROBENZENE
                                                                           10U DIBENZOFURAN
     100 BÉNZYL ALCOHOL
                                                                           10U 2,4-DINITROTOLUENE
                                                                          100 DIETHYL PHTHALATE
100 4-CHLOROPHENYL PHENYL ETHER
     10U 1.2-DICHLOROBENZENE
     100 2-METHYLPHENOL
     100 BIS(2-CHLOROISOPROPYL) ETHER
                                                                           10U FLUORENE
    10U (3-AND/OR 4-)METHYLPHÉNOL
10U N-NITROSODI-N-PROPYLAMINE
10U HEXACHLOROETHANE
                                                                           50U 4-NITROÄNILINE
                                                                          50U 2-METHYL-4.6-DINITROPHENOL
10U N-NITROSODIPHENYLAMINE/DIPHENYLAMINE
10U 4 BROMOPHENYL PHENYL ETHER
10U HEXACHLOROBENZENE (HCB)
          NITROBENZENE
     100
          ISOPHORONE
     10U
     100
          2-NITROPHENOL
                                                                           50U PENTACHLOROPHENOL
     10Ū
          2.4-DIMETHYLPHENOL
                                                                           10U PHENANTHRENE
          BENZOIC ACID
                                                                                ANTHRACENE
     50U
                                                                          100
     100
          BIS(2-CHLOROETHOXY) METHANE
                                                                               DI-N-BUTYLPHTHALATE
                                                                         10UJ
         2.4-DICHLOROPHENOL
1.2.4-TRICHLOROBENZENE
NAPHTHALENE
                                                                          100 FLUORANTHENE
     100
                                                                               PYRENE
     100
                                                                           100
                                                                          10U BENZYL BUTYL PHTHALATE
20U 3.3'-DICHLOROBENZIDINE
10UJ BENZO(A)ANTHRACENE
     10U
          4-CHLOROANILINE
     100
          HEXACHLOROBUTADIENE
     100
                                                                         10UJ
         4-CHLORO-3-METHYLPHENOL
2-METHYLNAPHTHALENE
     100
                                                                          100
                                                                                CHRYSENE
                                                                         4 100 : BIS(2-ETHYLHEXYL). PHTHALATE
     10U
          HEXACHLOROCYCLOPENTADIENE (HCCP)
     100
    100 2.4.6-TRICHLOROPHENOL
500 2.4.5-TRICHLOROPHENOL
                                                                          10U BENZO(B AND/OR K) FLUORANTHENE
                                                                          100
                                                                                BENZO-A-PYRENE
         2-CHLORONAPHIHALENE
2-NITROANILINE
    10U
                                                                          10U INDENO (1,2,3-CD) PYRENE
10U DIBENZO(A,H)ANTHRACENE
    50U
          DIMETHYL PHTHALATE
     10U
                                                                           100
                                                                               BENZO(GHI)PERYLENE
     100
    10U 2.6-DINITROTOLUENE
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REMARKS

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REMARKS

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SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD. ATHENS. GA.

01/04/91

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PESTICIDES/PCB'S DATA REPORT
PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL
    PROJECT NO. 91-025 SAMPLE NO. 51683 SAMPLE TYPE: GROUNDWA
    SOURCE: AMAX PHOSPHATE FACIL
                                                                                                                ..
    STATION ID: TW-01
                                                            COLLECTION START: 10/16/90 1625 STOP: 00/00/00
                                                                                                                ..
    CASE NUMBER: 15099
                            SAS NUMBER:
                                                             D. NUMBER: Y142
                                                                                                                **
                                                                                                                . .
UG/L
                    ANALYTICAL RESULTS
                                                            UG/L
                                                                              ANALYTICAL RESULTS
                                                                 METHOXYCHLOR
 O.050U ALPHA-BHC
                                                           0.50U
 0.0500
        BETA-BHC
                                                           0.100
                                                                 ENDRIN KETONE
                                                                 CHLORDANE (TECH. MIXTURE) /1
 0.0500
        DELTA-BHC
 0.050U
                                                                 GAMMA-CHLORDANE
        GAMMA-BHC (LINDANE)
                                                           0.50U
 0.050U HEPTACH
        HEPTACHLOR
                                                                 ALPHA-CHLORDANE
                                                           0.500
                                                            1.00
                                                                 TOXAPHENE
 0.050U HEPTACHLOR EPOXIDE
0.050U ENDOSULFAN I (ALPHA)
                                                                 PCB-1016 (AROCLOR 1016)
                                                           0.500
                                                           0.50U
                                                                 PCB-1221 (AROCLOR 1221)
  O. 10U DIELDRIN
                                                           0.500
                                                                 PCB-1232 (AROCLOR 1232)
  O. 10Ū
        4,4'-DDE (P.P'-DDE)
                                                           0.500
                                                                 PCB-1242 (AROCLOR 1242)
                                                                 PCB-1248 (AROCLOR 1248)
PCB-1254 (AROCLOR 1254)
PCB-1260 (AROCLOR 1260)
  0.100
        ENDRIN
                                                           0.500
  0.100
        ENDOSULFAN II (BETA)
                                                            1.0U
  Ö. 10U
        4,4' DDD (P,P'-DDD)
                                                            1.00
        ENDOSULFAN SULFATE
  0.100
  0.100
        4,4'-DDT (P,P'-DDT)
```

REMARKS

REMARKS

FOOTNOTES

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*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN

*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

*C-CONFIRMED BY GCMS

1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD. ATHENS. GA.

01/04/01

	EPA-REGIUN IV ESU, AIHENS, GA.	01/04/91
PURGEABLE ORGANICS DATA REPORT		
** PROJECT NO. 91-025 SAMPLE NO. 51690 SAMPLE	TYPE: GROUNDWA PROG ELEM: NSF COLLECTED BY: M GORDON	**
** SOURCE: AMAX PHOSPHATE FACIL	CITY: PALMETTO ST: FL	**
** STATION ID: TW-02	COLLECTION START: 10/17/90 1040 STOP: 00/	
**	352237301 37711733 1040 3701 30	• •
** CASE NO.: 15099 SAS N	NO.: D. NO.: Y146	• •
UG/L ANALYTICAL RESULTS	UG/L ANALYTICAL RESULTS	
daye AMAETITOAL RESULTS	ANALYTICAL RESULTS	
100 CHI ODOMETHANE	5U 1.2-DICHLOROPROPANE	
10U CHLOROMETHANE		
10U BROMOMETHANE	5U CIS-1,3-DICHLOROPROPENE	
10U VINYL CHLORIDE	5U TRICHLOROETHENE (TRICHLOROETHYLENE)	
10U CHLOROE THANE	5U DIBROMOCHLOROMETHANE	
6U METHYLENE CHLORIDE	5U 1.1.2-TRICHLOROETHANE	
10U ACETONE \5U CARBON DASULFIDE	SU BENZENE	
SU 1,1-DICHEOROETHENE(1.1-DICHLOROETHYLENE)	5U TRANS-1,3-DICHLOROPROPENE	
5U 1,1-DICHEOROETHENE(1.1-DICHLOROETHYLENE)	5U BROMOFORM	
5U 1,1-DICHLOROETHANE	10U METHYL ISOBUTYL KETONE	
50 1,2-DICHLOROETHENE (TOTAL)	10U METHYL BUTYL KETONE	
5U CHLOROFORM	5U TETRACHLOROETHENE(TETRACHLOROETHYLENE))
5U 1,2-DICHLOROETHANE	5U 1,1,2,2-TETRACHLOROETHANE	
10U METHYL ETHYL KETONE	5U TÔLÜÊNE	
5U 1 1 1-TRICHLOROETHANE	5U CHLÖROBENZENE	
5U CARBON TETRACHLORIDE	SU ETHYL BENZENE	
10U VINYL ACETATE	. STYRĒNĒ	
SU BROMODICHLOROMETHANE	SU TOTAL XVI FNES	

REMARKS

REMARKS

FOOTNOTES *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

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EXTRACTABLE ORGANICS DATA REPORT
PROG ELEM: NSF COLLECTED BY: M GORDON ST. FI
    PROJECT NO. 91-025 SAMPLE NO. 51690 SAMPLE TYPE: GROUNDWA
                                                                                                                              ..
     SOURCE: AMAX PHOSPHATE FACIL
                                                                    CITY: PALMETTO
                                                                                              ST: FL
                                                                    COLLECTION START: 10/17/90 1040 STOP: 00/00/00
    STATION ID: TW-02
..
                                                                                                                              * *
                                                                                                                              .
                                             SAS NO.:
                                                                     D. NO.: Y146
   CASE NO.: 15099
                                                                                                                              ..
   ANALYTICAL RESULTS
    UG/L
                                                                   UG/L
                                                                                       ANALYTICAL RESULTS
     10U PHENOL
                                                                     50U 3-NITROANILINE
    10U BIS(2-CHLOROETHYL) ETHER
10U 2-CHLOROPHENOL
                                                                     100 ACENAPHTHENE
                                                                     50U 2.4-DINITROPHENOL
     10U 1.3-DICHLOROBENZENE
                                                                     50U 4-NITROPHENOL
     10U 1.4-DICHLOROBENZENE
                                                                     10U DIBENZOFURAN
     100 BENZYL ALCOHOL
100 1,2-DICHLOROBENZENE
                                                                     10U 2.4-DINITROTOLUENE
10U DIETHYL PHTHALATE
     100 2-METHYLPHENOL
                                                                          4-CHLOROPHENYL PHENYL ETHER
                                                                     100
     100 BIS(2-CHLOROISOPROPYL) ETHER
                                                                     10U FLUORENE
     10U (3-AND/OR 4-)METHYLPHENOL
10U N-NITROSODI-N-PROPYLAMINE
                                                                     50U 4-NITROANILINE
                                                                     500 2-METHYL-4.6-DINITROPHENOL
100 N-NITROSODIPHENYLAMINE/DIPHENYLAMINE
     100 HEXACHLOROETHANE
     100 NITROBENZENE
                                                                     10U 4 BROMOPHENYL PHENYL ETHER
     10U ISOPHORONE
                                                                     100 HEXACHLOROBENZENE (HCB)
     10U 2-NITROPHENOL
                                                                     50U PENTACHLOROPHENOL
    10U 2.4-DIMETHYLPHENOL
42J BENZOIC ACID_
                                                                          PHENANTHRENE
                                                                     10U
                                                                         ANTHRACENE
                                                                     100
                                                                    10UJ DI-N-BUTYLPHTHALATE
    10U BIS(2-CHLOROETHOXY) METHANE
    10U 2.4-DICHLOROPHENOL
                                                                     100
                                                                         FLUORANTHENE
     100
        1.2.4-TRICHLOROBENZENE
                                                                     100
                                                                          PYRENE
        NAPHTHALENE
                                                                          BENZYL BUTYL PHTHALATE
     100
                                                                     100
    10U 4-CHLOROANILINE
                                                                     20U
                                                                          3,3'-DICHLOROBENZIDINE
    10U HEXACHLOROBUTADIENE
                                                                          BENZO(A)ANTHRACENE
                                                                    10UJ
    10U 4-CHLORO-3-METHYLPHENOL
10U 2-METHYLNAPHTHALENE
                                                                     100
                                                                          CHRYSENE
                                                                         BIS(2-ETHYLHEXYL) PHTHALATE
DI-N-OCTYLPHTHALATE
                                                                     100
100
     10U HEXACHLOROCYCLOPENTADIENE (HCCP)
    100 2,4,6-TRICHLOROPHENOL
500 2,4,5-TRICHLOROPHENOL
                                                                     100
                                                                          BENZO(B AND/OR K)FLUORANTHENE
                                                                          BENZO A-PYRENE
                                                                     100
    10U 2-CHLORONAPHTHALENE
                                                                         INDENO (1,2,3-CD) PYRENE
DIBENZO(A,H)ANTHRACENE
                                                                     100
    50U 2-NITROANILINE
     100 DIMETHYL PHTHALATE
                                                                     10U
                                                                          BENZO(GHI)PERYLENE
    10U ACENAPHTHYLENE
     10U 2.6-DINITROTOLUENE
```

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
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SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD. ATHENS. GA.

01/04/91

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PESTICIDES/PCB'S DATA REPORT
PROJECT NO. 91-025 SAMPLE NO. 51690 SAMPLE TYPE: GROUNDWA PROG ELEM: NSF COLLECTED BY: M GORDON
    SOURCE: AMAX PHOSPHATE FACIL
                                                            CITY: PALMETTO
                                                                                  ST: FL
..
                                                                                                               **
    STATION ID: TW-02
                                                            COLLECTION START: 10/17/90 1040 STOP: 00/00/00
                                                                                                              ..
    CASE NUMBER: 15099
                            SAS NUMBER:
                                                            D. NUMBER: Y146
                                                                                                              ..
**
                                                                                                               * *
UG/L
                    ANALYTICAL RESULTS
                                                            UG/L
                                                                             ANALYTICAL RESULTS
  O. 100 ALPHA-BHC
                                                            1.OU METHOXYCHLOR
        BETA-BHC
                                                           0.200
                                                                 ENDRIN KETONE
  O. 10U
  O. 100 DELTA-BHC
                                                                 CHLORDANE (TECH. MIXTURE) /1
  O. 10U GAMMA-BHC (LINDANE)
                                                            1 00
                                                                 GAMMA-CHLORDANE
  O 100 HEPTACHLOR
                                                            1.00
                                                                 ALPHA-CHLORDANE
  O. TOU ALDRIN
                                                            2.00
                                                                 TOXAPHENE
                                                                PCB-1016 (AROCLOR 1016)
PCB-1221 (AROCLOR 1221)
PCB-1232 (AROCLOR 1232)
PCB-1242 (AROCLOR 1242)
PCB-1248 (AROCLOR 1248)
  O. 100 HEPTACHLOR EPOXIDE
                                                            1.00
        ENDOSULFAN I (ALPHA)
  Ó. 10U
                                                            1.0U
  O. 20U
        DIELDRIN
                                                            1.00
        4.4'-DDE (P.P'-DDE)
  O.20U
                                                            1.00
        ENDRIN
                                                           1 . OŬ
  O. 200
        ENDOSULFAN II (BETA)
  0.200
                                                            2.0U
                                                                 PCB-1254 (AROCLOR 1254)
  0.200
        4.4' DDD (P.P' DDD)
                                                            2. OU
                                                                 PCB 1260 (AROCLOR 1260)
  0.200 ENDOSULFAN SULFATE
  0.20U 4.4'-DDT (P.P'-DDT)
```

REMARKS

REMARKS

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SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD, ATHENS, GA.

01/04/91

PURGEABLE ORGANICS DATA REPORT	ESD, ATTERS, GA.	01/04/91
** PROJECT NO. 91-025 SAMPLE NO. 51672 SAMPLE TYPE: GROUNDWA		* * * **
** SOURCE: AMAX PHOSPHATE FACIL	CITY: PALMETTO ST: FL	•
** STATION ID: TW-03	COLLECTION START: 10/17/90 1145 STOP: 00/00/00	• • •
**	302220113N 31NN . 10/17/30 1143 3101 . 00/00/00	• •
	D. NO.: Y151	
** CASE NO.: 15099 SAS NO.:	* * * * * * * * * * * * * * * * * * * *	
UG/Ł ANALYTICAL RESULTS	UG/L ANALYTICAL RESULTS	
·		
10U CHLOROMETHANE	5U 1,2-DICHLOROPROPANE	
10U BROMOMETHANE	5U CIS-1,3-DICHLOROPROPENE	
10U VINYL_CHLORIDE	5U TRICHLOROETHENE (TRICHLOROETHYLENE)	
10U CHLOROE THANE	5U DIBROMOCHLOROMETHANE	
<u>ŞU METHYLENE CHLORIDE</u>	5U 1,1,2-TRICHLOROETHANE	
10U ACETONE	5U BENZENE	
5U CARBON DISULFIDE	5U TRANS-1,3-DICHLOROPROPENE	
5U 1,1-DICHLOROETHENE(1,1-DICHLOROETHYLENE)	5U BROMOFORM	
5U 1.1-DICHLOROETHANE	10U METHYL ISOBUTYL KETONE	
5U 1.2-DICHLOROETHENE (TOTAL)	10U METHYL BUTYL KETONE	
5U CHLOROFORM	5U TETRACHLOROETHENE (TETRACHLOROETHYLENE)	
50 1,2-DICHLOROETHANE	5U 1,1,2,2-TETRACHLOROETHANE	
10U METHYL ETHYL KETONE	5U TOLUENE	
5U 1.1.1-TRICHLOROETHANE	5U CHLOROBENZENE	
5U CARBON TETRACHLORIDE	5U ETHYL BENZENE	
10U VINYL ACETATE	5U STYRENE	
5U BROMODICHLOROMETHANE	5U TOTAL XYLENES	

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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EXTRACTABLE ORGANICS DATA REPORT PROG ELEM: NSF COLLECTED BY: M GORDON ST: FL PROJECT NO. 91-025 SAMPLE NO. 51672 SAMPLE TYPE: GROUNDWA SOURCE: AMAX PHOSPHATE FACIL COLLECTION START: 10/17/90 1145 STOP: 00/00/00 STATION ID: TW-03 D. NO.: Y151 CASE NO.: 15099 SAS NO.: . ANALYTICAL RESULTS UG/L UG/L ANALYTICAL RESULTS 10U PHENOL 50U 3-NITROANILINE 10U BIS(2-CHLOROETHYL) ETHER 10U 2-CHLOROPHENOL 10U ACENAPHTHENE 50U 2.4-DINITROPHENOL 100 1.3-DICHLOROBENZENE 50U 4-NITROPHENOL 10U 1.4-DICHLOROBENZENE
10U BENZYL ALCOHOL
10U 1.2-DICHLOROBENZENE
10U 2-METHYLPHENOL 10U DIBENZOFURAN 10U 2,4-DINITROTOLUENE 100 DIETHYL PHTHALATE 10U 4-CHLOROPHENYL PHENYL ETHER 100 BIS(2-CHLOROISOPROPYL) ETHER 10U FLUORENE 10U (3-AND/OR 4-)METHYLPHENOL 10U N-NITROSODI-N-PROPYLAMINE 4-NITROANILINE 50U 500 2-METHYL-4.6-DINITROPHENOL 100 N-NITROSODIPHENYLAMINE/DIPHENYLAMINE 100 HEXACHLOROETHANE 10U NITROBENZENE 10U 4 BROMOPHENYL PHENYL ETHER ISOPHORONE
2-NITROPHENOL
2,4-DIMETHYLPHENOL 10Ū 10U HEXACHLOROBENZENE (HCB) 100 50U PENTACHLOROPHENOL 10U 10U PHENANTHRENE BÉNZOIC ACID ANTHRACENE 50U 10U 10UJ DI-N-BUTYLPHTHALATE 10U BIS(2-CHLOROETHOXY) METHANE FLUORANTHENE 10U 2.4-DICHLOROPHENOL 100 10U 1.2.4-TRICHLOROBENZENE 100 PYRENE 100 NAPHTHALENE 10U BENZYL BUTYL PHTHALATE 10U 4-CHLOROANILINE 20U 3,3'-DICHLOROBENZIDINE 100 HEXACHLOROBUTADIENE 10UJ BENZO(A)ANTHRACENE 10U 4-CHLORO-3-METHYLPHENOL 10U 2-METHYLNAPHTHALENE 100 CHRYSENE 10U BIS(2-ETHYLHEXYL) PHTHALATE 10U DI-N-OCTYLPHTHALATE HEXACHLOROCYCLOPENTADIENE (HCCP) 100 2.4.6-TRICHLOROPHENOL 2.4.5-TRICHLOROPHENOL 100 BENZO(B AND/OR K) FLUORANTHENE 100 50U 100 BENZO-A-PYRENE 10U 2-CHLORONAPHTHALENE 100 INDENO (1,2,3-CD) PYRENE 100 DIBENZO(A,H)ANTHRACENE 50U 2-NITROANILINE 100 DIMETHYL PHTHALATE 10U BENZO(GHI)PERYLENE 10U ACENAPHTHYLENE 100 2.6-DINITROTOLUENE

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
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SAMPLE AND ANALYSIS MANAGEMENT SYSTEM

EPA-REGION IV ESD. ATHENS. GA. 01/04/91 PESTICIDES/PCB'S DATA REPORT SAMPLE NO. 51672 SAMPLE TYPE: GROUNDWA PROG ELEM: NSF COLLECTED BY: M GORDON PROJECT NO. 91-025 .. * * SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO ST: FL .. * * COLLECTION START: 10/17/90 1145 STOP: 00/00/00 STATION ID: TW-03 ** CASE NUMBER: 15099 SAS NUMBER: .. D. NUMBER: Y151 ** ANALYTICAL RESULTS UG/L UG/L ANALYTICAL RESULTS 0.050U ALPHA-BHC O.50U METHOXYCHLOR 0.0500 BETA-BHC ENDRIN KETONE 0.100 0.0500 DELTA-BHC CHLORDANE (TECH. MIXTURE) /1 GAMMA-BHC (LINDANE) 0.0500 0.500 GAMMA-CHLORDANE /2 0.500 0.0500 HEPTACHLOR ALPHA-CHLORDANE 0.050U ALDRIN TOXAPHENE 1.00 HEPTACHLOR EPOXIDE 0.0500 0.500 PCB-1016 (AROCLOR 1016) 0.50U 0.50U 0.50U PCB-1221 (AROCLOR 1221) PCB-1232 (AROCLOR 1232) PCB-1242 (AROCLOR 1242) PCB-1248 (AROCLOR 1248) ENDOSULFAN I (ALPHA) 0.0500 0.100 DIELDRIN 4.4'-DDE (P.P'-DDE) 0.100 ENDRIN 0.100 0.500

1.00

1.0U

REMARKS

O. 10U

ENDOSULFAN II (BETA)

0.10U 4.4' DDD (P.P' DDD)

0.200 ENDOSULFAN SULFATE 0.10U 4.4'-DDT (P.P'-DDT)

REMARKS

PCB-1254 (AROCLOR 1254) PCB-1260 (AROCLOR 1260)

FOOTNOTES *NAI-INTERFERENCES ** J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *A-AVERAGE VALUE *NA-NOT ANALYZED *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN "L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN" *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT. *R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

*C-CONFIRMED BY GCMS 1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

PURGEABLE ORGANICS DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51662 SAMPLE TYPE: GROUNDWA PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO SOURCE: AMAX PHOSPHATE FACIL ** ST: FL STATION ID: TW-04 COLLECTION START: 10/18/90 1040 STOP: 00/00/00 * * SAS NO.: D. NO.: Y175 CASE NO.: 15099 **ANALYTICAL RESULTS** UG/L **ANALYTICAL RESULTS** UG/L 10U CHLOROMETHANE 5U 1.2-DICHLOROPROPANE 100 **BROMOME THANE** 5U CIS-1,3-DICHLOROPROPENE TRICHLOROETHENE (TRICHLOROETHYLENE) 100 VINYL CHLORIDE 5U 100 CHLOROE THANE 5U DIBROMOCHLOROMETHANE 40U METHYLENE CHLORIDE 1.1.2-TRICHLOROETHANE 10U ACETONE 5U BENZENE CARBON DISULFIDE 5U TRANS-1, 3-DICHLOROPROPENE 50 1.1-DICHLOROETHENE(1.1-DICHLOROETHYLENE) **5U BROMOFORM** 5U 1.1-DICHLOROETHANE 5U 100 METHYL ISOBUTYL KETONE 1.2-DICHLOROETHENE (TOTAL) 10U METHYL BUTYL KETONE 50 CHLOROFORM TETRACHLOROETHENE (TETRACHLOROETHYLENE) 5U 5U 1,2-DICHLOROETHANE 5Ü 1,1,2,2-TETRACHLOROETHANE 10UR METHYL ETHYL KETONE 5U 1,1,1-TRICHLOROETHANE ŠŬ. TOLUENE 5υ CHLOROBENZENE CARBON TETRACHLORIDE 5U ETHYL BENZENE 5U 100 VINYL ACETATE 5U STYRENE TOTAL XYLENES **BROMODICHLOROMETHANE**

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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EXTRACTABLE ORGANICS DATA REPORT
PROG ELEM: NSF COLLECTED BY: M GORDON
    PROJECT NO. 91-025 SAMPLE NO. 51662 SAMPLE TYPE: GROUNDWA
                                                                                                                       ..
    SOURCE: AMAX PHOSPHATE FACIL
                                                                CITY: PALMETTO
                                                                                         ST: FL
    STATION ID: TW-04
                                                                COLLECTION START: 10/18/90 1040 STOP: 00/00/00
..
                                                                                                                        ..
. .
                                                                                                                       ..
                                           SAS NO.:
   CASE NO.: 15099
                                                                 D. NO.: Y175
                                                                                                                       ..
   ANALYTICAL RESULTS
                                                                UG/L
   UG/L
                                                                                  ANALYTICAL RESULTS
        PHENOL
                                                                 100U 3-NITROANILINE
        BIS(2-CHLOROETHYL) ETHER
                                                                 20U ACENAPHTHENE
        2-CHLOROPHENOL
    20U
                                                                 100U 2.4-DINITROPHENOL
        1,3-DICHLOROBENZENE
                                                                 100U 4-NITROPHENOL
    20U
        1.4-DICHLOROBENZENE
                                                                 20U DIBENZOFURAN
    20U
        BÉNZYL ALCOHOL
                                                                 20U 2,4-DINITROTOLUENE
        1,2-DICHLOROBENZENE
2-METHYLPHENOL
                                                                      DIETHYL PHTHALATE
    20U
                                                                 20U
    20U
                                                                  20U
                                                                      4-CHLOROPHENYL PHENYL ETHER
        BIS(2-CHLOROISOPROPYL) ETHER
    200
                                                                  20U FLUORENE
        (3-AND/OR 4-)METHYLPHENOL
    20U
                                                                 1000
                                                                      4-NITROANILINE
                                                                      2-METHYL-4,6-DINITROPHENOL
N-NITROSODIPHENYLAMINE/DIPHENYLAMINE
        N-NITROSODI-N-PROPYLAMINE
                                                                 100U
        HEXACHLOROETHANE
    20U
                                                                 20U
    20U NITROBENZENE
                                                                      4 BROMOPHENYL PHENYL ETHER
                                                                 20U
    20V
        ISOPHORONE
                                                                 200 HEXACHLOROBENZENE (HCB)
    20U
        2-NITROPHENOL
                                                                 100Ú
                                                                      PENTACHLOROPHENOL
        2,4-DIMETHYLPHENOL
                                                                 200
200
                                                                      PHENANTHRENE
    20U
        BENZOIC ACID
                                                                      ANTHRACENE
   100U
        BIS(2-CHLOROETHOXY) METHANE
                                                                      DI-N-BUTYLPHTHALATE
    20U
                                                                20UJ
    20U
        2,4-DICHLOROPHENOL
                                                                 20U
                                                                      FLUORANTHENE
    20U
        1.2.4-TRICHLOROBENZENE
                                                                 20U
                                                                      PYRENE
    200
        NAPHTHALENE
                                                                 20U
                                                                      BENZYL BUTYL PHTHALATE
    20U
       4-CHLOROANILINE
                                                                 40U
                                                                      3,3'-DICHLOROBENZIDINE
    20U
        HEXACHLOROBUTADIENE
                                                                 20ÚJ
                                                                      BENZO(A)ANTHRACENE
       4-CHLORO-3-METHYLPHENOL
2-METHYLNAPHTHALENE
    20U
                                                                 20U
                                                                      CHRYSENE
                                                                      BIS(2-ETHYLHEXYL) PHTHALATE
    20U
                                                                 20U
        HEXACHLOROCYCLOPENTADIENE (HCCP)
                                                                      DI-N-OCTYLPHTHALATE
    20U
                                                                 20U
        2.4.6-TRICHLOROPHENOL
2,4,5-TRICHLOROPHENOL
    20U
                                                                 20U
                                                                      BENZO(B AND/OR K)FLUORANTHENE
   1000
                                                                 20Ŭ
                                                                      BENZO-A PYRENE
    20U 2-CHLORONAPHTHALENE
                                                                 20ú
                                                                     INDENO (1,2,3-CD) PYRENE
DIBENZO(A,H)ANTHRACENE
   100U 2-NITROANILINE
                                                                 20U
    20U DIMETHYL PHTHALATE
                                                                     BENZO(GHI)PERYLENE
    20U
        ACENAPHTHYLENE
    20U
        2.6-DINITROTOLUENE
```

REMARKS

REMARKS

FOOTNOIES

*A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN

*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD, ATHENS, GA.

01/04/91

PESTICIDES/PCB'S DATA REPORT	
** PROJECT NO. 91-025 SAMPLE NO. 51662 SAMPLE TYPE: GROUNDY	VA PROG ELEM: NSF COLLECTED BY: M GORDON **
** SOURCE: AMAX PHOSPHATE FACIL	
•• STATION ID: TW-04	COLLECTION START: 10/18/90 1040 STOP: 00/00/00 **
** SOURCE: AMAX PHOSPHATE FACIL ** STATION ID: TW-04 ** CASE NUMBER: 15099 SAS NUMBER:	D. NUMBER: Y175
**	4.8
UG/L ANALYTICAL RESULTS	UG/L ANALYTICAL RESULTS
O.1OU ALPHA-BHC	1.QU METHOXYCHLOR
O. 10U BETA-BHC	O. 20U ENDRIN KETONE
O. 10U DELTA-BHC	CHLORDANE (TECH. MIXTURE) /1
O. 10U GAMMA-BHC (LINDANE)	1.QU GAMMA-CHLORDANE /2
O. 10U HEPTACHLOR	1.0U ALPHA-CHLORDANE /2
O. 10U ALDRIN	2. QU TOXAPHENE
O. 10U HEPTACHLOR EPOXIDE	1.0U PCB-1016 (AROCLOR 1016)
O. 10U ENDOSULFAN I (ALPHA)	1.0U PCB-1221 (AROCLOR 1221)
0.20U DIELDRIN	1.0U PCB-1232 (AROCLOR 1232)
0.20U 4,4'-DDE (P.P'-DDE)	1.0U PCB-1242 (AROCLOR 1242)
O 20U ENDRIN	1.0U PCB-1248 (AROCLOR 1248)
O. 20U ENDOSULFAN II (BETA)	2.0U PCB-1254 (AROCLOR 1254)
0.20U 4.4' DDD (P.P' DDD)	2.0U PCB 1260 (AROCLOR 1260)
0.20U ENDOSULFAN SULFATE	
0.20U 4,4'-DDT (P,P'-DDT)	

REMARKS

REMARKS

FOOTNOTES

*A-AVERAGE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN

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*C-CONFIRMED BY GCMS

1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD, ATHENS, GA.

01/04/91

PURGEABLE ORGANICS DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51664 SAMPLE TYPE: GROUNDWA PROG ELEM: NSF COLLECTED BY: M GORDON SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO ST: FL STATION ID: TW-05 COLLECTION START: 10/18/90 0930 STOP: 00/00/00 .. * * .. * * SAS NO.: CASE NO.: 15099 D. NO.: Y172 UG/L ANALYTICAL RESULTS UG/L ANALYTICAL RESULTS 10U CHLOROMETHANE 5U 1,2-DICHLOROPROPANE 100 BROMOMETHANE 5U CIS-1.3-DICHLOROPROPENE 10U VINYL CHLORIDE 5U TRICHLOROETHENE (TRICHLOROETHYLENE) 10U CHLOROETHANE 5U DIBROMOCHLOROMETHANE METHYLENE CHLORIDE 5Ŭ 70U 1,1,2-TRICHLOROETHANE 20U ACETONE 5U BENZENE CARBON DISULFIDE TRANS-1, 3-DICHLOROPROPENE 5U **5**U BROMOFORM 1.1-DICHLOROETHENE(1,1-DICHLOROETHYLENE) ŠÜ. **5**U 1.1-DICHLOROETHANE METHYL ISOBUTYL KETONE 50 100 5Ü 1,2-DICHLOROETHENE (TOTAL) METHYL BUTYL KETONE 100 CHLOROFORM 5U TETRACHLOROETHENE (TETRACHLOROETHYLENE) 1,2-DICHLOROETHANE **5**U 1,1,2,2-TETRACHLOROETHANE 10UR METHYL ETHYL KETONE 50 TOLUENE 1,1,1-TRICHLOROE THANE **5**U 50 CHLOROBENZENE ETHYL BENZENE **5U** CARBON TETRACHLORIDE 5U 100 VINYL ACETATE 5U STYRENE **BROMODICHLOROMETHANE** 5U TOTAL XYLENES

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT. *R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

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EXTRACTABLE ORGANICS DATA REPORT
SAMPLE NO. 51664 SAMPLE TYPE: GROUNDWA
                                                                   PROG ELEM: NSF COLLECTED BY: M GORDON
    PROJECT NO. 91-025
    SOURCE: AMAX PHOSPHATE FACIL
                                                                   CITY: PALMETTO
..
                                                                                             ST: FL
    STATION ID: TW-05
                                                                   COLLECTION START: 10/18/90 0930 STOP: 00/00/00
..
..
                                                                                                                            .
   CASE NO.: 15099
                                             SAS NO.:
                                                                    D. NO.: Y172
..
   ANALYTICAL RESULTS
                                                                  UG/L
                                                                                     ANALYTICAL RESULTS
    10U PHENOL
                                                                    50U 3-NITROANILINE
    10U BIS(2-CHLOROETHYL) ETHER
10U 2-CHLOROPHENOL
                                                                    10U ACENAPHTHENE
                                                                    50U 2.4-DINITROPHENOL
    100 1,3-DICHLOROBENZENE
                                                                    50U 4-NITROPHENOL
    10U 1.4-DICHLOROBENZENE
10U BENZYL ALCOHOL
10U 1.2-DICHLOROBENZENE
10U 2-METHYLPHENOL
                                                                    10U DIBENZOFURAN
                                                                    100 2,4-DINITROTOLUENE
                                                                    100 DIETHYL PHTHALATE
                                                                         4-CHLOROPHENYL PHENYL ETHER
                                                                    100
    100 BIS(2-CHLOROISOPROPYL) ETHER
                                                                         FLUORENE
                                                                    100
         (3-AND/OR 4-)METHYLPHENOL
                                                                    500
                                                                         4-NITROANILINE
    10U
         N-NITROSODI-N-PROPYLAMINE
                                                                         2-METHYL-4,6-DINITROPHENOL
N-NITROSODIPHENYLAMINE/DIPHENYLAMINE
    1 OU
                                                                    500
        HEXACHLOROE THANE
        NITROBENZENE
    1ŎŪ
                                                                    100
                                                                         4- BROMOPHENYL PHENYL ETHER
        ISOPHORONE
                                                                         HEXACHLOROBENZENE (HCB)
    100
                                                                    100
        2-NITROPHENOL
2.4-DIMETHYLPHENOL
BENZOIC ACID
    100
                                                                    50U
                                                                        PENTACHLOROPHENOL
                                                                         PHENANTHRENE
    10U
                                                                    100
                                                                         ANTHRACENE
    50U
                                                                    100
                                                                         DI-N-BUTYLPHTHALATE
         BIS(2-CHLOROETHOXY) METHANE
                                                                   10UJ
    10U
    1 OU
         2,4-DICHLOROPHENOL
                                                                    100
                                                                         FLUORANTHENE
    10U 1.2.4-TRICHLOROBENZENE
                                                                    100
                                                                         PYRENE
    100 NAPHTHALENE
                                                                    10U
                                                                         BENZYL BUTYL PHTHALATE
    10U 4-CHLOROANILINE
                                                                    20U 3.3'-DICHLOROBENZIDINE
    10U HEXACHLOROBUTADIENE
                                                                   10UJ
                                                                        BENZO(A)ANTHRACENE
    10U 4-CHLORO-3-METHYLPHENOL
10U 2-METHYLNAPHTHALENE
                                                                         CHRYSENÉ
                                                                    100
                                                                         BIS(2-ETHYLHEXYL) PHTHALATE
DI-N-OCTYLPHTHALATE
                                                                    100
         HEXACHLOROCYCLOPENTADIENE (HCCP)
    10U
                                                                    100
         2.4,6-TRICHLOROPHENOL
                                                                         BENZO(B AND/OR K) FLUORANTHENE
    100
                                                                    100
         2.4.5-TRICHLOROPHENOL
2-CHLORONAPHTHALENE
                                                                         BENZO-A-PYRENE
    50U
                                                                    100
    10U
                                                                         INDENO (1.2.3-CD) PYRENE
                                                                    100
         2-NITROANILINE
    50U
                                                                        DIBENZO(A.H)ANTHRACENE
    100 DIMETHYL PHTHALATE
                                                                        BENZO(GHI)PERYLENE
    10U ACENAPHTHYLENE
    10U 2.6-DINITROTOLUENE
```

REMARKS

REMARKS

F001N01ES

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD. ATHENS. GA.

01/04/91

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PESTICIDES/PCB'S DATA REPORT
PROJECT NO. 91-025 SAMPLE NO. 51664 SAMPLE TYPE: GROUNDWA
                                                          PROG ELEM: NSF COLLECTED BY: M GORDON ST. FL
**
                                                                                                             * *
                                                                           ST: FL
    SOURCE: AMAX PHOSPHATE FACIL
..
                                                           CITY: PALMETTO
                                                                                                             **
                                                           COLLECTION START: 10/18/90 0930 STOP: 00/00/00
..
    STATION ID: TW-05
                                                                                                             ..
                           SAS NUMBER:
    CASE NUMBER: 15099
                                                            D. NUMBER: Y172
                                                                                                             * *
. .
                                                                                                             ..
ANALYTICAL RESULTS
                                                           UG/L
                                                                            ANALYTICAL RESULTS
   UG/L
                                                          0.50U METHOXYCHLOR
 0.050U ALPHA-BHC
                                                          O. 10U ENDRIN KETONE
 0.0500
       BETA-BHC
 0.0500
        DELTA-BHC
                                                                CHLORDANE (TECH. MIXTURE) /1
                                                          0.500
                                                                GAMMA-CHLORDANE
 0.0500
        GAMMA-BHC (LINDANE)
        HEPTACHLOR
                                                          0.500
                                                                ALPHA-CHLORDANE
 0.0500
                                                           1.00
                                                                TOXAPHENE
        ALDRIN
 0.0500
                                                          0.50U PCB-1016 (AROCLOR 1016)
0.50U PCB-1221 (AROCLOR 1221)
0.50U PCB-1232 (AROCLOR 1232)
0.50U PCB-1242 (AROCLOR 1242)
 0.0500
        HEPTACHLOR EPOXIDE
 0.0500
        ENDOSULFAN I (ALPHA)
  0.100
        DIELDRIN
        4.4'-DDE (P.P'-DDE)
  0.10U
       ENDRIN
                                                          0.500
                                                                PCB-1248 (AROCLOR 1248)
  0.100
                                                           1.0U PCB-1254 (AROCLOR 1254)
  O. 100
       ENDOSULFAN II (BETA)
  0.10U
       4,4' DDD (P,P' DDD)
                                                           1.0U PCB 1260 (AROCLOR 1260)
  0.30U ENDOSULFAN SULFATE
  0.100
       4.4'-DDT (P.P'-DDT)
```

REMARKS

REMARKS

FOOTNOTES

*A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN

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*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

*C-CONFIRMED BY GCMS 1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD. ATHENS. GA.

01/04/91

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. .

MISCELLANEOUS PURGEABLE ORGANICS - DATA REPORT

STATION ID: TW-05

CASE NO .: 15099

..

PROG ELEM: NSF COLLECTED BY: M GORDON PROJECT NO. 91-025 SAMPLE NO. 51664 SAMPLE TYPE: GROUNDWA ST: FL

SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO

COLLECTION START: 10/18/90 0930 STOP: 00/00/00 SAS NO.:

D. NO.: Y172 MD NO: Y172

ANALYTICAL RESULTS UG/L

7JN TETRAMETHYLBUTANE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
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PURGEABLE	E ORGANICS DATA REPORT		01/04/31
*** * PRO		PROG ELEM: NSF COLLECTED BY: M GORDON	• • • • • • • • • •
** STAT	RCE: AMAX PHOSPHATE FACIL FION ID: P8-01	CITY: PALMETTO ST: FL COLLECTION START: 10/15/90 0630 STOP: 0	
CASE	NO.: 15099 SAS NO.: ANALYTICAL RESULTS	D. NO.: Y325 UG/L ANALYTICAL RESULTS	**
100 100 100 100 200 200 50 50 50 100 50 50	CHLOROMETHANE BROMOMETHANE VINYL CHLORIDE CHLOROETHANE METHYLENE CHLORIDE ACETONE CARBON DISULFIDE 1,1-DICHLOROETHENE(1,1-DICHLOROETHYLENE) 1,1-DICHLOROETHANE 1,2-DICHLOROETHENE (TOTAL) CHLOROFORM 1,2-DICHLOROETHANE METHYL ETHYL KETONE 1,1,1-TRICHLOROETHANE VINYL ACETATE BROMODICHLOROMETHANE	5U 1,2-DICHLOROPROPANE 5U CIS-1,3-DICHLOROPROPENE 5U TRICHLOROETHENE(TRICHLOROETHYLENE) 5U DIBROMOCHLOROMETHANE 5U 1,1,2-TRICHLOROETHANE 5U BÉNZENE 5U TRANS-1,3-DICHLOROPROPENE 5U BROMOFORM 10U METHYL ISOBUTYL KETONE 10U METHYL BUTYL KETONE 5U TETRACHLOROETHENE(TETRACHLOROETHYLEN 5U T.1,2,2-TETRACHLOROETHANE 5U TOLUENE 5U CHLOROBENZENE 5U STYRENE 5U STYRENE	E)

REMARKS

REMARKS

FOOTNOTES *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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EXTRACTABLE ORGANICS DATA REPORT
PROJECT NO. 91-025 SAMPLE NO. 51642 SAMPLE TYPE: GROUNDWA
                                                                PROG ELEM: NSF COLLECTED BY: M GORDON
..
                                                                                                                        * *
    SOURCE: AMAX PHOSPHATE FACIL
                                                                 CITY: PALMETTO
..
                                                                                          ST: FL
    STATION ID: PB-01
                                                                 COLLECTION START: 10/15/90 0630 STOP: 00/00/00
..
                                                                                                                        ..
                                                                                                                        ..
                                           SAS NO.:
   CASE NO.: 15099
                                                                  D. NO.: Y325
                                                                                                                        ..
   ANALYTICAL RESULTS
   UG/L
                                                                UG/L
                                                                                   ANALYTICAL RESULTS
    10U PHENOL
                                                                  50U 3-NITROANILINE
    100 BIS(2-CHLOROETHYL) ETHER
100 2-CHLOROPHENOL
                                                                  10U ACENAPHTHENE
                                                                  50U 2.4-DINITROPHENOL
        1,3-DICHLOROBENZENE
                                                                  50V
                                                                      4-NITROPHENOL
    100
    100 1.4-DICHLOROBENZENE
                                                                  10U DIBENZOFURAN
    10U BENZYL ALCOHOL
                                                                  10U 2.4-DINITROTOLUENE
    10U 1,2-DICHLOROBENZENE
                                                                  100 DIETHYL PHTHALATE
                                                                      4-CHLOROPHENYL PHENYL ETHER
    100 2-METHYLPHENOL
                                                                  100
    100 BIS(2-CHLOROISOPROPYL) ETHER
                                                                  100
                                                                      FLUORENE
    10U (3-AND/OR 4-)METHYLPHENOL
10U N-NITROSODI-N-PROPYLAMINE
                                                                  50U
                                                                      4-NITROANILINE
                                                                      2-METHYL-4.6-DINITROPHENOL
N-NITROSODIPHENYLAMINE/DIPHENYLAMINE
                                                                  50U
        HEXACHLOROETHANE
    100
                                                                  100
        NITROBENZENE
    100
                                                                  100
                                                                      4 BROMOPHENYL PHENYL ETHER
        ISOPHORONE
                                                                      HEXACHLOROBENZENE (HCB)
    100
                                                                  100
    10U 2-NITROPHENOL
                                                                      PENTACHLOROPHENOL
                                                                  50U
        2,4-DIMETHYLPHENOL
    100
                                                                  100
                                                                      PHENANTHRENE
                                                                      ANTHRACENE
    50U
        BENZOIC ACID
                                                                  100
        BIS(2-CHLOROETHOXY) METHANE
    10U
                                                                 10UJ
                                                                      DI-N-BUTYLPHTHALATE
        2,4-DICHLOROPHENOL
    10U
                                                                      FLUORANTHENE
                                                                  10U
                                                                      PYRENE
    100
        1.2.4-TRICHLOROBENZENE
                                                                  100
        NAPHTHALENE
    10U
                                                                  100
                                                                      BENZYL BUTYL PHTHALATE
    10Ú
         4-CHLOROANILINE
                                                                  20U
                                                                      3,3'-DICHLOROBENZIDINE
    100
        HEXACHLOROBUTADIENE
                                                                      BENZO(A)ANTHRACENE
                                                                 10UJ
        4-CHLORO-3-METHYLPHENOL
2-METHYLNAPHTHALENE
    100
                                                                  100
                                                                      CHRYSENE
    100
                                                                  100
                                                                      BIS(2-ETHYLHEXYL) PHTHALATE
                                                                      DI-N-OCTYLPHTHALATE
    10U
        HEXACHLOROCYCLOPENTADIENE (HCCP)
                                                                  10U
        2.4.6-TRICHLOROPHENOL
    100
                                                                      BENZO(B AND/OR K)FLUORANTHENE
                                                                  100
    50Ü
        2.4.5-TRICHLOROPHENOL
                                                                  100
                                                                      BENZO-A-PYRENE
                                                                      INDENO (1.2.3-CD) PYRENE
DIBENZO(A.H)ANTHRACENE
    100
        2-CHLORONAPHTHALENE
                                                                  100
    50U 2-NITROANILINE
                                                                  100
    100 DIMETHYL PHTHALATE
                                                                      BENZO(GHI)PERYLENE
    10U ACENAPHTHYLENE
        2.6-DINITROTOLUENE
```

REMARKS

REMARKS

FOOTNOTES *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD, ATHENS. GA.

01/04/91

PESTICIDES/PCB'S DATA REPORT ** PROJECT NO. 91-025 SAMPLE NO. 51642 SAMPLE TYPE: GROUND ** SOURCE: AMAX PHOSPHATE FACIL ** STATION ID: PB-01 ** CASE NUMBER: 15099 SAS NUMBER:	
UG/L ANALYTICAL RESULTS	* * * * * * * * * * * * * * * * * * *
O.050U ALPHA-BHC O.050U BETA-BHC O.050U DELTA-BHC O.050U GAMMA-BHC (LINDANE) O.050U HEPTACHLOR O.050U ALDRIN O.050U HEPTACHLOR EPOXIDE O.050U ENDOSULFAN I (ALPHA) O.10U DIELDRIN O.10U DIELDRIN O.10U 4,4'-DDE (P.P'-DDE) O.10U ENDRIN O.10U ENDRIN O.10U ENDOSULFAN II (BETA) O.10U 4,4' DDD (P.P' DDD) O.30U ENDOSULFAN SULFATE	0.50U METHOXYCHLOR 0.10U ENDRIN KETONE CHLORDANE (TECH. MIXTURE) /1 0.50U GAMMA-CHLORDANE /2 0.50U ALPHA-CHLORDANE /2 1.0U TOXAPHENE 0.50U PCB-1016 (AROCLOR 1016) 0.50U PCB-1221 (AROCLOR 1221) 0.50U PCB-1232 (AROCLOR 1232) 0.50U PCB-1242 (AROCLOR 1242) 0.50U PCB-1248 (AROCLOR 1248) 1.0U PCB-1254 (AROCLOR 1254) 1.0U PCB 1260 (AROCLOR 1260)

REMARKS

0.10U 4,4'-DDT (P,P'-DDT)

REMARKS

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*C-CONFIRMED BY GCMS
1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD, ATHENS, GA.

01/04/91

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MISCELLANEOUS PURGEABLE ORGANICS - DATA REPORT

PROG ELEM: NSF COLLECTED BY: M GORDON PROJECT NO. 91-025 SAMPLE NO. 51642 SAMPLE TYPE: GROUNDWA

.. SOURCE: AMAX PHOSPHATE FACIL ..

CITY: PALMETTO ST: FL COLLECTION START: 10/15/90 0630 STOP: 00/00/00

STATION ID: PB-01 CASE . NO .: 15099 SAS NO.:

MD NO: Y325 D. NO.: Y325

ANALYTICAL RESULTS UG/L

6JN **ACETALDEHYDE**

FOOTNOTES

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^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM

01/04/01

			00000+		EPA-F	GEGTON TA F	SU, ATHE	NS, GA.				01/04/91
PUR	GEABLE	ORGANICS DATA	REPURI									
***	PROJ SOUR	ECT NO. 91-025 CE: AMAX PHOSP ION ID: MW-01	SAMPLE N	NO. 51673 SA	MPLE TYPE:	GROUNDWA	PROG CITY:	ELEM: NSF PALMETTO	COLLECTED	BY: M GORDON ST: FL 1130 STOP		
**	CASE	NO : 15099		•	SAS NO .		Ð N	n · v326				**
***		* * * * * * *	* * * * * *					* * * * *				
	UG/L		ANALYTICAL	RESULTS			UG/L		ANALYTIC	AL RESULTS		
	100 100 100 100 50 100 50 50 50 50 50 50	CHLOROMETHANE BROMOMETHANE VINYL CHLORID CHLOROETHANE METHYLENE CHL ACETONE CARBON DISULF 1,1-DICHLOROE 1,2-DICHLOROE CHLOROFORM 1,2-DICHLOROE METHYL ETHYL 1,1,1-TRICHLO CÁRBON TETRAC VINYL ACETATE BROMODICHLOROE	E DRIDE THENE(1.1-DI THANE THENE (TOTAL THANE KETONE ROETHANE HLORIDE		NE)			TRICHLOROE DIBROMOCHL 1,1,2-TRIC BENZENE TRANS-1,3- BROMOFORM METHYL ISO METHYL BUT TETRACHLOR	CHLOROPROPE THENE (TRICH OROMETHANE HLOROETHANE DICHLOROPRO BUTYL KETON VL KETONE OETHENE (TET TRACHLOROET ENE	LOROETHYLENE PENE E RACHLOROETHY	,	

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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01/04/91

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EXTRACTABLE ORGANICS DATA REPORT
PROG ELEM: NSF COLLECTED BY: M GORDON
    PROJECT NO. 91-025 SAMPLE NO. 51673 SAMPLE TYPE: GROUNDWA
                                                                                                                           * *
    SOURCE: AMAX PHOSPHATE FACIL
                                                                  CITY: PALMETTO
                                                                                            ST: FL
                                                                  COLLECTION START: 10/16/90 1130 STOP: 00/00/00
    STATION ID: MW-01
..
                                                                                                                           . .
                                                                                                                           ..
   CASE NO.: 15099
                                            SAS NO.:
                                                                   D. NO.: Y326
                                                                                                                           ..
UG/L
                      ANALYTICAL RESULTS
                                                                 UG/L
                                                                                     ANALYTICAL RESULTS
    10U PHENOL
                                                                   50U 3-NITROANILINE
    100 BIS(2-CHLOROETHYL) ETHER
                                                                    10U ACENAPHTHENE
    10U 2-CHLOROPHENOL
                                                                   50U 2.4-DINITROPHENOL
    100 1.3-DICHLOROBENZENE
                                                                    50U 4-NITROPHENOL
    10U 1,4-DICHLOROBENZENE
                                                                    100 DIBENZOFURAN
    10U BENZYL ALCOHOL
10U 1,2-DICHLOROBENZENE
10U 2-METHYLPHENOL
                                                                   10U 2.4-DINITROTOLUENE
10U DIETHYL PHTHALATE
                                                                    10U 4-CHLOROPHENYL PHENYL ETHER
    100 BIS(2-CHLOROISOPROPYL) ETHER
                                                                   10U FLUORENE
        (3-AND/OR 4-)METHYLPHENOL
                                                                   50U 4-NITROANILINE
    100
                                                                   50U 2-METHYL-4.6-DINITROPHENOL
10U N-NITROSODIPHENYLAMINE/DIPHENYLAMINE
    10U N-NITROSODI-N-PROPYLAMINE
    10U HEXACHLOROETHANE
                                                                   100 4 BROMOPHENYL PHENYL ETHER
    10U NITROBENZENE
                                                                   100 HEXACHLOROBENZENE (HCB)
    10U ISOPHORONE
    10U 2-NITROPHENOL
                                                                   50U PENTACHLOROPHENOL
    100 2.4-DIMETHYLPHENOL
500 BENZOIC ACID
                                                                    10U PHENANTHRENE
                                                                        ANTHRACENE
                                                                   10U
    10U BIS(2-CHLOROETHOXY) METHANE
10U 2,4-DICHLOROPHENOL
                                                                   10UJ DI-N-BUTYLPHTHALATE
                                                                   100 FLUORANTHENE
    10U 1.2.4-TRICHLOROBENZENE
                                                                   10U PYRENE
    100 NAPHTHALENE
                                                                   100 BENZYL BUTYL PHTHALATE
    10U 4-CHLOROANILINE
                                                                   20U 3,3'-DICHLOROBENZIDINE
    10U HEXACHLOROBUTADIENE
                                                                   10UJ BENZO(A)ANTHRACENE
    10U 4-CHLORO-3-METHYLPHENOL
                                                                   100 CHRYSENE
                                                                   10U BIS(2-ETHYLHEXYL) PHTHALATE
10U DI-N-OCTYLPHTHALATE
10U BENZO(B AND/OR K)FLUORANTHENE
    10U 2-METHYLNAPHTHALENE
    10U HEXACHLOROCYCLOPENTADIENE (HCCP)
    10U 2.4.6-TRICHLOROPHENOL
                                                                       BENZO-A-PYRENE
    50U 2.4.5-TRICHLOROPHENOL
                                                                   100
                                                                       INDENO (1,2,3-CD) PYRENE
DIBENZO(A,H)ANTHRACENE
    10U 2-CHLORONAPHTHALENE
                                                                   100
    50U 2-NITROANILINE
                                                                   10U
    100 DIMETHYL PHTHALATE
                                                                   10U BENZO(GHI)PERYLENE
    10U ACENAPHTHYLENE
    10U 2.6-DINITROTOLUENE
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REMARKS

REMARKS

F001NOTES

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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SAMPLE AND ANALYSIS MANAGEMENT SYSTEM

EPA-REGION IV ESD, ATHENS, GA. 01/04/91 PESTICIDES/PCB'S DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51673 SAMPLE TYPE: GROUNDWA PROG ELEM: NSF COLLECTED BY: M GORDON SOURCE: AMAX PHOSPHATE FACIL .. CITY: PALMETTO ST: FL . . COLLECTION START: 10/16/90 1130 STOP: 00/00/00 STATION ID: MW-01 CASE NUMBER: 15099 SAS NUMBER: D. NUMBER: Y326 . ** .. UG/L ANALYTICAL RESULTS UG/L ANALYTICAL RESULTS 0.50U METHOXYCHLOR O. OSOU ALPHA-BHC 0.0500 BETA-BHC O. 10U ENDRIN KETONE 0.050U 0.050U 0.050U DELTA-BHC CHLORDANE (TECH. MIXTURE) /1 GAMMA-BHC (LINDANE) 0.50U GAMMA-CHLORDANE /2 0.50U ALPHA-CHLORDANE HEPTACHLOR TOXAPHENE 0.050U ALDRIN 1.0U 0.50U PCB-1016 (AROCLOR 1016) 0.50U PCB-1221 (AROCLOR 1221) 0.50U PCB-1232 (AROCLOR 1232) 0.50U PCB-1242 (AROCLOR 1242) 0.50U PCB-1248 (AROCLOR 1248) 0.0500 HEPTACHLOR EPOXIDE 0.0500 ENDOSULFAN I (ALPHA) DIELDRIN 0.1QU 4.4'-DDE (P.P'-DDE) 0.100 ENDRIN O. 10U

REMARKS

0.100 O. 100 ENDOSULFAN II (BETA)

4.4'-DDD (P.P' DDD)

O. 10U ENDOSULFAN SULFATE 0.10U 4.4'-DDT (P.P'-DDT)

REMARKS

1.0U PCB-1254 (AROCLOR 1254) 1.0U PCB 1260 (AROCLOR 1260)

^{*}NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *A-AVERAGE VALUE

^{*}K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

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SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD. ATHENS, GA.

01/04/91

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MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT

CASE.NO.: 15099

PROJECT NO. 91-025 SAMPLE NO. 51673 SAMPLE TYPE: GROUNDWA PROG ELEM: NSF COLLECTED BY: M GORDON

SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO STATION ID: MW-01

D. NO.: Y326 MD NO: Y326

ANALYTICAL RESULTS UG/L

10JN DIETHYLMETHYLBENZAMIDE

SAS NO.:

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT. *R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD, ATHENS. GA.

01/04/91

DHPC	EABLE ORGANICS DATA REPORT	EFA REGION IN ESD, A	RINLES, CA.	01/04/91

	PROJECT NO. 91-025 SAMPLE NO. 51687 SAMPLE 1		ROG ELEM: NSF COLLECTED BY: M GORDON	**
**	SOURCE: AMAX PHOSPHATE FACIL		ITY: PALMETTO ST: FL	••
**	STATION ID: MW-03			00/00/00
* *		_		**
* *	CASE NO.: 15099 SAS NO	O.:	D. NO.: Y328	**
***				• • • • • • • • • • • • • • • • • • • •
	UG/L ANALYTICAL RESULTS	UG/	L ANALYTICAL RESULTS	
	10U CHLOROMETHANE		5U 1.2-DICHLOROPROPANE	
	10U BROMOMETHANE		5U CIS-1.3-DICHLOROPROPENE	
	10U VINYL CHLORIDE		5U TRICHLOROETHENE (TRICHLOROETHYLENE)	
	10U CHLOROETHANE		5U DIBROMOCHLOROMETHANE	
	5U METHYLENE CHLORIDE		5U 1,1,2-TRICHLOROETHANE	
	20U ACETONE		5U BENZENE	
	50 CARBON DISULFIDE		5U TRANS-1,3-DICHLOROPROPENE	
	5U 1,1-DICHLOROETHENE(1,1-DICHLOROETHYLENE)		5U BROMOFORM	
	5U 1,1-DICHLOROETHANE 5U 1,2-DICHLOROETHENE (TOTAL)		OU METHYL ISOBUTYL KETONE	
	5U CHLOROFORM		OU METHYL BUTYL KETONE SU TETRACHLOROETHYLE	INE Y
	5U 1,2-DICHLOROETHANE		5U 1,1,2,2-TETRACHLOROETHANE	.NE)
	10UR METHYL ETHYL KETONE		5U TOLUËNE	
	5U 1.1.1-TRICHLOROETHANE		5U CHLOROBENZENE	
	5U CARBON TETRACHLORIDE		SU ETHYL BENZENE	
	10U VINYL ACETATE	·	5U STYRENE	
	5U BROMODICHLOROMETHANE		5U TOTAL XYLENES	

REMARKS

REMARKS

FOOINDIES

*A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

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EPA-REGION IV ESD, ATHENS, GA. 01/04/91

EXTRACTAB	LE ORGANICS DATA REPORT	•	
*** * * *	ECT NO. 91-025 SAMPLE NO. 51687 SAMPLE TYPE: GROUNDWA		• • • • • • • • • • • • • • • • • • • •
** PROJ	ECT NO. 91-025 SAMPLE NO. 51687 SAMPLE TYPE: GROUNDWA	PROG	ELEM: NSF COLLECTED BY: M_GORDON **
	CE: AMAX PHOSPHATE FACIL	CITY:	: PALMETTO ST: FL **
	ION ID: MW-03	COLLE	ECTION START: 10/17/90 0900 STOP: 00/00/00 **
**	AIO . 45000 SAS NO .	D 1	**
· CASE	NO.: 15099 SAS NO.:		NU.: Y326
UG/L	AMALYTICAL DECINTS	UG/L	ANALYTICAL RESULTS
UG/L		UU/L	ANALYTICAL RESULTS
100	PHENOL BIS(2-CHLOROETHYL) ETHER 2-CHLOROPHENOL 1,3-DICHLOROBENZENE 1,4-DICHLOROBENZENE BENZYL ALCOHOL 1,2-DICHLOROBENZENE 2-METHYLPHENOL BIS(2-CHLOROISOPROPYL) ETHER (3-AND/OR 4-) METHYLPHENOL	5011	3-NITROANILINE
	BIS(2-CHLOROETHYL) ETHER		ACENAPHTHENE
	2-CHLOROPHENOL	SÕŬ	2.4-DINITROPHENOL
	1.3-DICHLOROBENZENE		4-NITROPHENOL
100	1,4-DICHLOROBENZENE	ĬŎŬ	
	BÉNZYL ALCOHOL	100	
100	1.2-DICHLOROBENZENE		DIETHYL PHTHALATE
	2-METHYLPHENOL	100	
100	BIS(2-CHLOROISOPROPYL) ETHER		
100	(O. WAD) OV A JME HILE LIFE AND		4-NITROANILINE
	N-NITROSODI-N-PROPYLAMINE		2-METHYL-4,6-DINITROPHENOL
	HEXACHLOROETHANE .	100	
100	NITROBENZENE	100	4 BROMOPHENYL PHENYL ETHER
	ISOPHORONE		HEXACHLOROBENZENE (HCB)
100	2-NITROPHENOL		PENTACHLOROPHENOL
100	2.4-DIMETHYLPHENOL BENZOIC ACID		PHENANTHRENE ANTHRACENE
100	BIS(2-CHLOROETHOXY) METHANE		DI-N-BUTYLPHTHALATE
100	2.4-DICHLOROPHENOL	1003	FLUORANTHENE
	1,2,4-TRICHLOROBENZENE	100	
iõŭ	NAPHTHALENE		BENZYL BUTYL PHTHALATE
100	4-CHLOROANILINE		
	HEXACHLOROBUTADIENE	1003	
100	4-CHLORO-3-METHYLPHENOL	100	
100	2-METHYLNAPHTHALENE		BIS(2-ETHYLHEXYL) PHTHALATE
	HEXACHLOROCYCLOPENTADIENE (HCCP)		DI-N-OCTYLPHTHALATE
	2,4,6-TRICHLOROPHENOL	100	BENZO(B AND/OR K)FLUORANTHENE
	2.4.5-TRICHLOROPHENOL		BENZO-A-PYRENE
100	2-CHLORONAPHTHALENE		INDENO (1,2,3-CD) PYRENE
	2-NITROANILINE		DIBENZO(A.H)ANTHRACENE
	DIMETHYL PHTHALATE	100	BENZO(GHI)PERYLENE
	ACENAPHTHYLENE		
100	2.6-DINITROTOLUENE		

REMARKS

REMARKS

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SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD, ATHENS, GA.

01/04/91 PESTICIDES/PCB'S DATA REPORT *** * * * * * * * * * * * PROJECT NO. 91-025 SAMPLE NO. 51687 SAMPLE TYPE: GROUNDWA PROG ELEM: NSF COLLECTED BY: M GORDON * * SOURCE: AMAX PHOSPHATE FACIL ST: FL .. CITY: PALMETTO .. COLLECTION START: 10/17/90 0900 STOP: 00/00/00 STATION ID: NW-03 . . SAS NUMBER: CASE NUMBER: 15099 D. NUMBER: Y328 ** . ** ANALYTICAL RESULTS UG/L UG/L ANALYTICAL RESULTS 0.50U METHOXYCHLOR 0.050U ALPHA-BHC 0.050U BETA-BHC O. 10U ENDRIN KETONE 0.050U DELTA-BHC CHLORDANE (TECH. MIXTURE) /1 O.50U GAMMA-CHLORDANE O. OSOU GAMMA-BHC (LINDANE) 0.50U ALPHA-CHLORDANE 0.050U HEPTACHLOR 0.050U ALDRIN 1.00 TOXAPHENE 0.500 PCB-1016 (AROCLOR 1016) 0.500 PCB-1221 (AROCLOR 1221) 0.500 PCB-1232 (AROCLOR 1232) 0.050U HEPTACHLOR EPOXIDE PCB-1221 (AROCLOR 1221) PCB-1232 (AROCLOR 1232) PCB-1242 (AROCLOR 1242) PCB-1248 (AROCLOR 1248) PCB-1254 (AROCLOR 1254) 0.050U ENDOSULFAN I (ALPHA) O. 10U DIELDRIN 0.10U 4,4'-DDE (P,P'-DDE) 0.50U O. 100 ENDRIN 0.500 O. 10U ENDOSULFAN II (BETA) 1.OU 0.10U 4.4' DDD (P.P' DDD) 1.00 PCB-1260 (AROCLOR 1260)

REMARKS

REMARKS

FOOTNOTES

0.200 ENDOSULFAN SULFATE 0.10U 4.4'-DDT (P.P'-DDT)

*C-CONFIRMED BY GCMS 1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

^{*}NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *A-AVERAGE VALUE •NA-NOT ANALYZED

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SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD, ATHENS, GA.

01/04/91

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MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT

SAS NO.:

STATION ID: MW-03

CASE NO.: 15099

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PROJECT NO. 91-025 SAMPLE NO. 51687 SAMPLE TYPE: GROUNDWA PROG ELEM: NSF COLLECTED BY: M GORDON .. SOURCE: AMAX PHOSPHATE FACIL

CITY: PALMETTO ST: FL

COLLECTION START: 10/17/90 0900 STOP: 00/00/00

D. NO.: Y328

MD NO: Y328

ANALYTICAL RESULTS UG/L

BUTYLIDENEBISDIMETHYLETHYLMETHYLPHENOL SJN' OCTANOIC ACID

^{*}A-ACTUAL VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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PURGEABLE ORGANICS DATA REPORT											01,04,01		
*** * *													
** PRO	JECT NO. 91-025	SAMPLE N	NO. 51679 SAM	PLE TYPE:	GROUNDWA	PROG	ELEM: NSF	COLLECTED	BY: M GOE	RDON			* *
	RCE: AMAX PHOSP					CITY	PALMETTO		ST: FL				
	TION ID: MW-04							: 10/16/90		TOP: 00/	00/00		
**								,,			,,,,,		* *
** CAS	E NO.: 15099		S	AS NO.:		D. N	O.: Y327						**
*** * *							* * * * *						
UG/L		ANALYTICAL	RESULTS			UG/L		ANALYTIC	CAL RESULT	rs			
100	CHLOROMETHANE					50	1,2-DICHLO	ROPROPANE					
100								CHLOROPROPE	NF				
iŏŭ		E				ŠŬ		THENE (TRICK		FNF)			
100		-				ŠŬ	DIBROMOCHL						
ŠŬ	METHYLENE CHL	ORIDE				5Ŭ		HLOROE THANE					
200						ŠŨ	BENZENE		•				
14	CARBON DISULF	IDE				5ŭ		DICHLOROPRO	PENE				
ŚÚ			ICHLOROETHYLEN	E)		5Ü	BROMOFORM						
5U	1.1-DICHLOROE	THANE				100	METHYL ISO	BUTYL KETON	1E				
50	1.2-DICHLOROE	THENE (TOTAL	_)			100	METHYL BUT	YL KETONE					
50 50	CHLOROFORM		•			50	TETRACHLOR	OETHENE (TET	RACHLOROE	THYLENE)			
50	1,2-DICHLOROE	THANE				50		TRACHLOROE1	HANE				
10UR	METHYL ETHYL					5 U	TOLUENE						
50	1,1,1-TRICHLO					5บ	CHLOROBENZ						
50	CARBON TETRAC					50	ETHYL BENZ	ENE					
100	VINYL ACETATE					5บ	STYRENE						
50	BROMODICHLORO	METHANE				5U	TOTAL XYLE	NES					

REMARKS

REMARKS

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01/04/91

EXTRACTAE	LE ORGANICS DATA REPORT					01,04,01
*** * * *					* * * * * * * *	* * * * * * * * ***
** PROJ	ECT NO. 91-025 SAMPLE NO. 51679 SAMPLE TYPE: GROUNDWA	PROG	ELEM: NSF C	COLLECTED	BY: M GORDON	**
** SOUR	LE: AMAX PHUSPHAIE FACIL	CITY:	PALMETTO		SI: FI	**
	ION ID: MW-04	COLLE	CTION START:	10/16/90	1520 STOP: 00	
**	NO. 15000		10 VOOT			**
** CASE	NO.: 15099 SAS NO.:	U. N	IU.: Y327			**
UG/L	ANALYTICAL RESULTS	ile (i		ANALYTIC	AL RESULTS	
UU/L	MENET FICHE RESULTS	OG/L		ANALTIIC	AL RESULTS	
1011	PHENOL	50II	3-NITROANIL	ME		
	BIS(2-CHLOROETHYL) ETHER		ACENAPHTHENE			
	2-CHLOROPHENOL		2.4-DINITROF			
	1.3-DICHLOROBENZENE		4-NITROPHENC			
100		100	DIBENZOFURAN			
100	RÉNZYI ALCOHOL	100	2,4-DINITRO			
100	1,2-DICHLOROBENZENE		DIETHYL PHTH			
100	2-METHYLPHENOL		4-CHLOROPHEN		ETHER	
100	BIS(2-CHLOROISOPROPYL) ETHER					
100	(3-AND/OR 4-)METHYLPHENOL	50U	4-NITROANILI	INE		
100	N-NITROSODI-N-PROPYLAMINE			S-DINITROP	HENOL	
	HE XACHLOROE THANE	100	N-NITROSODIF	PHENYLAMIN	E/DIPHENYLAMINE	
	NITROBENZENE	100	4 BROMOPHENY	L PHENYL	ETHER	
	ISOPHORONE		HEXACHLOROBE		B)	
	2-NITROPHENOL		PENTACHLOROP			
100	2,4-DIMETHYLPHENOL		PHENANTHRENE			
	BENZOIC ACID		ANTHRACENE			
100	BIS(2-CHLOROETHOXY) METHANE 2,4-DICHLOROPHENOL		DI-N-BUTYLPH			
100	1.2.4-TRICHLOROBENZENE	100	FLUORANTHENE PYRENE			
100	NAPHTHALENE	100	BENZYL BUTYL	DUTUAL AT	E	
	4-CHLOROANIL INE		3,3'-DICHLOR			
	HEXACHLOROBUTADIENE		BENZO(A)ANTH		L	
100	4-CHLORO-3-METHYLPHENOL		CHRYSENÉ	INACEME		
100	2-METHYLNAPHTHALENE		BIS (2-ETHYLH	IFXVI) PHT	HAI ATF	
	HEXACHLOROCYCLOPENTADIENE (HCCP)		DI-N-OCTYLPH			
	2.4.6-TRICHLOROPHENOL	100			RANTHENE	
50U	2.4.5-TRICHLOROPHENOL	100	BENZO-A-PYRE	NE		
100	2-CHLORONAPHTHALENE	10Ū	INDENO (1,2.	3-CD) PYR	ENE	
50U	2-NITROANILINE	100	DIBENZO(A,H)	ANTHRACEN	E	
100	DIMETHYL PHTHALATE	100	BENZO(GHI)PE	RYLENE		
100	ACENAPHTHYLENE					
100	2.6-DINITROTOLUENE					

REMARKS

REMARKS

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD. ATHENS. GA.

01/04/91 DESTICIOES/DOR'S DATA REPORT

PESTICIDES/PCD S DATA REPORT *** * * * * * * * * * * * * * * * * *	PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/16/90 1520 STOP: 00/00/00 D. NUMBER: Y327
UG/L ANALYTICAL RESULTS	UG/L ANALYTICAL RESULTS
0.050U ALPHA-BHC 0.050U BETA-BHC 0.050U DELTA-BHC 0.050U GAMMA-BHC (LINDANE) 0.050U HEPTACHLOR 0.050U ALDRIN 0.050U HEPTACHLOR EPOXIDE 0.050U ENDOSULFAN I (ALPHA) 0.10U DIELDRIN 0.10U DIELDRIN 0.10U 4.4'-DDE (P.P'-DDE) 0.10U ENDOSULFAN II (BETA) 0.10U 4.4'-DDD (P.P' DDD) 0.30U ENDOSULFAN SULFATE 0.10U 4.4'-DDT (P.P'-DDT)	O.5OU METHOXYCHLOR O.1OU ENDRIN KETONE CHLORDANE (TECH. MIXTURE) /1 O.5OU GAMMA-CHLORDANE /2 O.5OU ALPHA-CHLORDANE /2 1.OU TOXAPHENE O.5OU PCB-1016 (AROCLOR 1016) O.5OU PCB-1232 (AROCLOR 1221) O.5OU PCB-1232 (AROCLOR 1232) O.5OU PCB-1248 (AROCLOR 1248) 1.OU PCB-1254 (AROCLOR 1254) 1.OU PCB-1254 (AROCLOR 1254) 1.OU PCB-1256 (AROCLOR 1256)

REMARKS

REMARKS

FOOTNOTES *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.
*C-CONFIRMED BY GCMS
1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD, ATHENS, GA.

01/04/91

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MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT

PROJECT NO. 91-025 SAMPLE NO. 51679 SAMPLE TYPE: GROUNDWA PROG ELEM: NSF COLLECTED BY: M GORDON

SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO ST: FL

STATION ID: MW-04 COLLECTION START: 10/16/90 1520 STOP: 00/00/00 .. D. NO.: Y327 MD NO: Y327 .. CASE.NO.: 15099 SAS NO.:

. . **

ANALYTICAL RESULTS UG/L

100JN CAPROLACTAM BUTYLIDENBISDIMETHYLETHYLMETHYLPHENOL 20JN 20J 1 UNIDENTIFIED COMPOUND

FOOTNOTES

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
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SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD, ATHENS, GA.

01/04/91 PURGEABLE ORGANICS DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51676 SAMPLE TYPE: GROUNDWA PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO SOURCE: AMAX PHOSPHATE FACIL .. ST: FL .. STATION ID: MW-05 COLLECTION START: 10/16/90 1350 STOP: 00/00/00 ** * * CASE NO.: 15099 SAS NO.: D. NO.: Y329 UG/L ANALYTICAL RESULTS UG/L **ANALYTICAL RESULTS** 10U CHLOROMETHANE 5U 1,2-DICHLOROPROPANE BROMOMETHANE 10U 5U CIS-1, 3-DICHLOROPROPENE VINYL CHLORIDE 10Ü TRICHLOROETHENE (TRICHLOROETHYLENE) CHLOROETHANE METHYLENE CHLORIDE 100 **DIBROMOCHLOROMETHANE** 80 5U 1.1.2~TRICHLOROETHANE ACETONE ŠŬ. BENZENE 10U CARBON DISULFIDE 50 TRANS-1, 3-DICHLOROPROPENE 1,1-DICHLOROETHENE(1,1-DICHLOROETHYLENE) 5Ú BROMOFORM 1.1-DICHLOROETHANE 100 METHYL ISOBUTYL KETONE 100 METHYL BUTYL KETONE 1.2-DICHLOROETHENE (TOTAL) CHLOROFORM 5U TETRACHLOROETHENE (TETRACHLOROETHYLENE) 50 1,2-DICHLOROETHANE ŠÜ. 1,1,2,2-TETRACHLOROETHANE 10UR METHYL ETHYL KETONE 5U 1.1.1-TRICHLOROETHANE TOLUENE 50 CHLOROBENZENE CARBON TETRACHLORIDE 5Ú ETHYL BENZENE

REMARKS

10U

VINYL ACETATE

BROMODICHLOROMETHANE

REMARKS

5U

STYRENE TOTAL XYLENES

^{***}FOOINOTES***

*A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

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01/04/91

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EXTRACTABLE ORGANICS DATA REPORT
PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/16/90 1350 STOP: 00/00/00
    PROJECT NO. 91-025 SAMPLE NO. 51676 SAMPLE TYPE: GROUNDWA
    SOURCE: AMAX PHOSPHATE FACIL
    STATION ID: MW-05
..
                                                                                                                              ..
                                                                                                                              * *
                                              SAS NO :
                                                                     D. NO.: Y329
   CASE NO.: 15099
                                                                                                                              . .
ANALYTICAL RESULTS
                                                                   UG/L
                                                                                       ANALYTICAL RESULTS
   UG/L
                                                                     50U 3-NITROANILINE
    10U PHENOL
    100 BIS(2-CHLOROETHYL) ETHER
100 2-CHLOROPHENOL
                                                                     10U ACENAPHTHENE
                                                                     50U 2.4-DINITROPHENOL
    10U 1.3-DICHLOROBENZENE
10U 1.4-DICHLOROBENZENE
                                                                     50U 4-NITROPHENOL
                                                                     10U DIBENZOFURAN
                                                                     100 2.4-DINITROTOLUENE
    10U BENZYL ALCOHOL
    10U 1.2-DICHLOROBENZENE
                                                                     100 DIETHYL PHTHALATE
    10U 2-METHYLPHENOL
                                                                     10U 4-CHLOROPHENYL PHENYL ETHER
    100 BIS(2-CHLOROISOPROPYL) ETHER
                                                                     10U FLUORENE
    10U (3-AND/OR 4-)METHYLPHÉNOL
10U N-NITROSODI-N-PROPYLAMINE
                                                                     50U 4-NITROANILINE
                                                                     50U 2-METHYL-4.6-DINITROPHENOL
10U N-NITROSODIPHENYLAMINE/DIPHENYLAMINE
    10U HEXACHLOROETHANE
                                                                     100 4 BROMOPHENYL PHENYL ETHER
    10U NITROBENZENE
    100
        ISOPHORONE
                                                                     100 HEXACHLOROBENZENE (HCB)
    100
        2-NITROPHENOL
                                                                     50U PENTACHLOROPHENOL
    10U 2,4-DIMETHYLPHENOL
                                                                     10U PHENANTHRENE
    500 BENZOIC ACID
                                                                     10U ANTHRACENE
    10U BIS(2-CHLOROETHOXY) METHANE
                                                                    10UJ DI-N-BUTYLPHTHALATE
        2.4-DICHLOROPHENOL
                                                                     10U FLUORANTHENE
    100
         1.2.4-TRICHLOROBENZENE
NAPHTHALENE
                                                                     10U PYRENE
    100
                                                                     100 BENZYL BUTYL PHTHALATE
200 3.3'-DICHLOROBENZIDINE
    10U
         4-CHLOROANILINE
    100
                                                                    10UJ BENZO(A)ANTHRACENE
    10U HEXACHLOROBUTADIENE
    10U 4-CHLORO-3-METHYLPHENOL
                                                                     10U CHRYSENÉ
    10U 2-METHYLNAPHTHALENE
                                                                     10U BIS(2-ETHYLHEXYL) PHTHALATE
                                                                     100 DI-N-OCTYLPHTHALATE
    10U HEXACHLOROCYCLOPENTADIENE (HCCP)
    10U 2.4.6-TRICHLOROPHENOL
50U 2.4.5-TRICHLOROPHENOL
                                                                     100 BENZO(B AND/OR K) FLUORANTHENE
                                                                     100 BENZO-A-PYRENE
    100
         2-CHLORONAPHTHALENE
                                                                     100 INDENO (1,2,3-CD) PYRENE
100 DIBENZO(A,H)ANTHRACENE
    50U
         2-NITROANILINE
    100 DIMETHYL PHTHALATE
                                                                     100 BENZO(GHI)PÉRYLENE
    100
        ACENAPHTHYLENE
         2.6-DINITROTOLUENE
```

REMARKS

REMARKS

F00[N0]ES

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SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD. ATHENS. GA.

01/04/91

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PESTICIDES/PCB'S DATA REPORT
PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL
    PROJECT NO. 91-025 SAMPLE NO. 51676 SAMPLE TYPE: GROUNDWA
..
    SOURCE: AMAX PHOSPHATE FACIL
                                                                               ST: FL
                                                          COLLECTION START: 10/16/90 1350 STOP: 00/00/00
    STATION ID: MW-05
                                                                                                           ..
                           SAS NUMBER:
..
    CASE NUMBER: 15099
                                                          D. NUMBER: Y329
                                                                                                           **
. .
ANALYTICAL RESULTS
                                                          UG/L
                                                                          ANALYTICAL RESULTS
   UG/L
 O. OSOU ALPHA-BHC
                                                         O.50U METHOXYCHLOR
 0.0500
                                                         O. 100
                                                               ENDRIN KETONE
        BETA-BHC
 0.050U
0.050U
0.050U
        DELTA-BHC
                                                               CHLORDANE (TECH. MIXTURE) /1
        GAMMA-BHC (LINDANE)
                                                         0.500
                                                               GAMMA~CHLORDANE
                                                                            /2
       HEPTACHLOR
                                                         0.500
                                                               ALPHA-CHLORDANE
 0.0500
        ALDRIN
                                                         1.00
                                                               TOXAPHENE
                                                               PCB-1016 (AROCLOR 1016)
 0.0500
        HEPTACHLOR EPOXIDE
                                                         0.500
                                                               PCB-1221 (AROCLOR 1221)
PCB-1232 (AROCLOR 1232)
        ENDOSULFAN I (ALPHA)
                                                         0.50Ū
 0.050U
                                                         0.50U
        DIELDRIN
  0.100
        4.4'-DOE (P.P'-DDE)
                                                         0.500
                                                               PCB-1242 (AROCLOR 1242)
  0.100
  O. 10U ENDRIN
                                                         0.50U
                                                               PCB-1248 (AROCLOR 1248)
  O. 10U ENDOSULFAN II (BETA)
                                                          1.00
                                                               PCB-1254 (AROCLOR 1254)
  0.10U 4.4' DDD (P.P' DDD)
                                                          1.00
                                                              PCB 1260 (AROCLOR 1260)
  0.200 ENDOSULFAN SULFATE
  0.10U 4.4'-DDT (P.P'-DDT)
```

REMARKS

REMARKS

FOOTNOTES

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SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD, ATHENS, GA.

01/04/91

MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51676 SAMPLE TYPE: GROUNDWA PROG ELEM: NSF COLLECTED BY: M GORDON SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO ST: FL * * * * STATION ID: MW-05 COLLECTION START: 10/16/90 1350 STOP: 00/00/00 ** * * CASE . NO .: 15099 MD NO: Y329 D. NO.: Y329 ** SAS NO.: * * .. * *

ANALYTICAL RESULTS UG/L

OCTANOIC ACID 6JN 5JN 3018 BIS (HYDROXYETHYL) DODECANAMIDE 10JN BUTYLIDENEBISDIMETHYLETHYLMETHYLPHENOL 100J 3 UNIDENTIFIED COMPOUNDS

FOOTNOTES

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SAMPLE AND ANALYSIS MANAGEMENT SYSTEM

EPA-REGION IV ESD. ATHENS, GA. 01/04/91 PURGEABLE ORGANICS DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51682 SAMPLE TYPE: GROUNDWA PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO SOURCE: AMAX PHOSPHATE FACIL .. ST: FL ** STATION ID: MW-06 COLLECTION START: 10/16/90 1615 STOP: 00/00/00 ** CASE NO.: 15099 SAS NO.: D. NO.: Y143 * * ** UG/L ANALYTICAL RESULTS UG/L **ANALYTICAL RESULTS** CHLOROMETHANE 100 5U 1.2-DICHLOROPROPANE **BROMOMETHANE** 100 5U CIS-1.3-DICHLOROPROPENE VINYL CHLORIDE 10U TRICHLOROETHENE (TRICHLOROETHYLENE) 100 CHLOROE THANE DIBROMOCHLOROMETHANE METHYLENE CHLORIDE 1.1.2-TRICHLOROETHANE BENZENE 5U 5U 50U ACETONE 5U CARBON DISULFIDE 5U TRANS-1, 3-DICHLOROPROPENE 1,1-DICHLOROETHENE(1,1-DICHLOROETHYLENE) BROMOFORM 50 5U 1,1-DICHLOROETHANE 5U 10U METHYL ISOBUTYL KETONE 1.2-DICHLOROETHENE (TOTAL) 100 METHYL BUTYL KETONE CHLOROFORM TETRACHLOROETHENE (TETRACHLOROETHYLENE) 5Ü 1,2-DICHLOROETHANE 1,1,2,2-TETRACHLOROETHANE 10UR METHYL ETHYL KETONE 5U TOLUENE 5U 1.1.1-TRICHLOROETHANE 5Ú CHLOROBENZENE CARBON TETRACHLORIDE ETHYL BENZENE

REMARKS

10U

VINYL ACETATE

BROMODICHLOROME THANE

REMARKS

STYRENE

TOTAL XYLENES

F001N01ES

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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EPA-REGION IV ESD, ATHENS, GA. 01/04/91 EXTRACTABLE ORGANICS DATA DEDOPT

EXTR	ACTAB	LE ORGANICS DAT	A REPORT						
••	PROJ	ECT NO. 91-025	SAMPLE NO. 5168	* * * * * * * * * * * * * * * * * * *	UNDWA PROG	ELEM: NSF C	COLLECTED BY: M G	ORDON	* * * * * * * * * * * * * * * * * * * *
**	SOUR	CE: AMAX PHOSPH	ATE FACIL		CITY	PALMETTO	ST: FL	CTOD: 00/00/00	**
		ION ID: MW-06					10/16/90 1615		••
**	CASE	NO.: 15099		SAS NO.:	D. A	Ю.: Y143			**
					* * * * * * *				
	UG/L		ANALYTICAL RESULTS		UG/L		ANALYTICAL RESU	LTS	
	100	PHENOL			500	3-NITROANILI	INF		
	ioŭ	BIS(2-CHLOROET	HYL) ETHER		100	ACENAPHTHENE			
	100	2-CHLOROPHENOL	-	•	5 0 U	2,4-DINITROP			
	100	1,3-DICHLOROBE	NZENE		500	4-NITROPHENO			•
	100	1.4-DICHLOROBE	NZENE		100	DIBENZOFURAN			
	100	BENZYL ALCOHOL	NJENE		100	2.4-DINITROT			
	100 100	1,2-DICHLURUBE	NZ CNE		100	DIETHYL PHTH	MALAIE		
	100	BIS(2-CHLOROIS	ODDODVI) FTHED		100	FLUORENE	IYL PHENYL ETHER		
	100	(3-AND/OR 4-)M	FTHYI PHENOL		5011	4-NITROANILI	NF		
	ίου	N-NITROSODI-N-	PROPYLAMINE		50Ŭ		-DINITROPHENOL		
	1ŎŬ	HEXACHLOROETHA	NE		100	N-NITROSODIP	PHENYLAMINE/DIPHE	NYLAMINE	
	100	NITROBENZENE			100	4 BROMOPHENY	L PHENYL ETHER		
	100	ISOPHORONE			100	HEXACHLOROBE			
	100	2-NITROPHENOL			500	PENTACHLOROF			
	100	2.4-DIMETHYLPH	ENUL		100	PHENANTHRENE	_		
•	50U 10U	RISCO-CHI OPOFTI	HOYV) METHANE		100	ANTHRACENE DI-N-BUTYLPH	ITHAL ATE		
	100	2 4-DICHLOROPH	FMOI		100	FLUORANTHENE			
	100	1.2.4-TRICHLOR	OBENZENE		iou	PYRENE	-		
	100	NAPHTHALENE			iŏū	BENZYL BUTYL	. PHTHALATE		
	100	4-CHLOROANILIN	E		200	3.3'-DICHLOR			
	100	HEXACHLOROBUTA	DIENE		10UJ	BENZO(A)ANTH	IRACENE		
	100	4-CHLORO-3-MET	HYLPHENOL		100	CHRYSENE	> 6 4		
	10U 10U	Z-METHYLNAPHIH	ALENE ODENTADIENE (NCCD)		100		EXYL) PHTHALATE		
	100	2 4 6-TETCH OF	OPENIADIENE (HCCP)		100	DI-N-OCTYLPH	TIMALAIC TOD KIELHODANTHENI	E	
	500	2.4.6-TRICHLOR	OPHEMOL		100	RENZOLD AND/	(OR K)FLUORANTHENI ENE	•	
	100	2-CHLORONAPHTH	ALENE		100	INDENO (1.2.			
	50Ū	2-NITROANILINE			100	DIBENZO(A,H)			
	100	DIMETHYL PHTHA	LATE		100	BENZO (GHI) PE			
	100	ACENAPHTHYLENE							
	100	2.6-DINITROTOL	UENE						

REMARKS

REMARKS

FOOTNOTES

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SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD, ATHENS, GA.

01/04/91

PESTICIDES/PCB'S DATA REPORT	ETA NEGIGIA IV ESS., ATTENS., GA.	01/04/91
	TYPE: GROUNDWA PROG ELEM: NSF COLLECTED BY: M GORDON ST: FL COLLECTION START: 10/16/90 1615 STOP: D. NUMBER: Y143	**
UG/L ANALYTICAL RESULTS	UG/L ANALYTICAL RESULTS	• • • • • • • • • • • • • • • • • • • •
0.050U ALPHA-BHC 0.050U BETA-BHC 0.050U DELTA-BHC 0.050U GAMMA-BHC (LINDANE) 0.050U HEPTACHLOR 0.050U ALDRIN 0.050U HEPTACHLOR EPOXIDE 0.050U ENDOSULFAN I (ALPHA) 0.10U DIELDRIN 0.10U DIELDRIN 0.10U 4.4'-DDE (P,P'-DDE) 0.10U ENDOSULFAN II (BETA) 0.10U 4.4' DDD (P,P' DDD) 0.10U 4.4'-DDT (P,P'-DDT)	0.50U METHOXYCHLOR 0.10U ENDRIN KETONE CHLORDANE (TECH. MIXTURE) /1 0.50U GAMMA-CHLORDANE /2 0.50U ALPHA-CHLORDANE /2 1.0U TOXAPHENE 0.50U PCB-1016 (AROCLOR 1016) 0.50U PCB-1221 (AROCLOR 1221) 0.50U PCB-1232 (AROCLOR 1232) 0.50U PCB-1242 (AROCLOR 1242) 0.50U PCB-1248 (AROCLOR 1248) 1.0U PCB-1254 (AROCLOR 1254) 1.0U PCB-1260 (AROCLOR 1260)	

REMARKS

REMARKS

FOOTNOTES *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

*C-CONFIRMED BY GCMS

1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD, ATHENS, GA.

01/04/91

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MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT

STATION ID: MW-06

CASE.NO.: 15099

PROJECT NO. 91-025 SAMPLE NO. 51682 SAMPLE TYPE: GROUNDWA PROG ELEM: NSF COLLECTED BY: M GORDON SOURCE: AMAX PHOSPHATE FACIL

CITY: PALMETTO ST: FL

COLLECTION START: 10/16/90 1615 STOP: 00/00/00

D. NO.: Y143

MD NO: Y143

ANALYTICAL RESULTS UG/L

70JN CAPROLACTAM

SAS NO.:

FOOTNOTES

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^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD, ATHENS, GA.

01/04/91

DUDC	FARIF	ORGANICS DATA	REPORT			~ WEGIC	M IV L	SU, AINE	M3, UA.				01/04/91
***	* * *	* * * * * *	* * * * *										
**	PROJ	ECT NO. 91-025	SAMPLE	NO. 51684							BY: M GORDON		• • • • • • • • • • • • • • • • • • • •
**	SOUR	CE: AMAX PHOSP	HATE FACIL		D			CITY	PALMETTO	COLLECTED	ST: FL		• •
**	STAT	ION ID: PW-01						COLLE	CTION START	10/17/90	0935 STOP	- 00/00/00	• • • • • • • • • • • • • • • • • • • •
**	• • • • • • • • • • • • • • • • • • • •										5101	. 00,00,00	• •
**	CASE	NO.: 15099			SAS NO.	. :		D. N	0.: Y147				• •
***				* * * * * *									
	UG/L		ANALYTICAL	RESULTS				UG/L		ANALYTIC	CAL RESULTS		
	-							-					
		CHLOROMETHANE						<u>5</u> U	1,2-DICHLO				
		BROMOMETHANE	_					<u>50</u>					
		VINYL CHLORID	<u>t</u>					50			!LOROETHYLENE)	
		CHLOROE THANE	20105					<u>50</u>	DIBROMOCHL				
	, 5 U	METHYLENE CHL	DKIDE					<u>5</u> U		HLOROETHANE			
	100	ACETONE CARBON DISULF	t n E					<u>5</u> U	BENZENE	D T CLUI ODODO	NEME .		
		1.1-DICHLOROE		TOUL OBOETUS	/I ENIE \			<u>ອ</u> ູບ		DICHLOROPRO	PENE		
	50 50	1.1-DICHLOROE		TCHLORUE IN	(LENE)			.5U	BROMOFORM	DUTVI VETOL	Æ		
	50 50	1.2-DICHLOROE		1.5				10U 10U	METHYL BUT	BUTYL KETON)C		
	5Ŭ	CHLOROFORM	INCIAL (IOIA	L)				50			RACHLOROETHY	EME	
	SŬ	1,2-DICHLOROE	THANF	•				5Ŭ		TRACHLOROET		LENE)	
		MÉTHYL ETHYL						5Ŭ	TÓLUENE	T NACTICOROL I	IMIT		
	50	1.1.1-TRICHLO						50	CHLOROBENZ	FNF			
		CARBON TETRACI						รีบั	ETHYL BENZ				
		VINYL ACETATE						5Ŭ	STYRENE				
	์ 50	BROMODICHLORO						รับ	TOTAL XYLE	NES			

REMARKS

REMARKS

FOOTNOTES **COUNCIES***

*A-ACTUAL VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN

*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

01/04/91

** PROJECT NO. 91-025 SAMPLE NO. 51684 SAMPLE TYPE: GROUNDWA ** SOURCE: AMAX PHOSPHATE FACIL ** STATION ID: PW-01 **COLLECTION START: 10/17/90 0935 STOP: 00/00/00	* *
A.F. 115	**
** CASE NO.: 15099 SAS NO.: UG/L ANALYTICAL RESULTS D. NO.: Y147 UG/L ANALYTICAL RESULTS	**
100	

REMARKS

REMARKS

FOOTNOTES

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
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SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD. ATHENS. GA.

01/04/91

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PESTICIDES/PCB'S DATA REPORT
PROJECT NO. 91-025 SAMPLE NO. 51684 SAMPLE TYPE: GROUNDWA
                                                          PROG ELEM: NSF COLLECTED BY: M GORDON
    SOURCE: AMAX PHOSPHATE FACIL
                                                          CITY: PALMETTO
                                                                                 ST: FL
                                                          COLLECTION START: 10/17/90 0935 STOP: 00/00/00
    STATION ID: PW-01
..
                                                                                                            ..
                           SAS NUMBER:
    CASE NUMBER: 15099
                                                           D. NUMBER: Y147
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..
                                                                                                           ..
UG/L
                   ANALYTICAL RESULTS
                                                          UG/L
                                                                           ANALYTICAL RESULTS
 0.050U ALPHA-BHC
                                                         0.50U METHOXYCHLOR
 0.050U BETA-BHC
                                                         O. 10U ENDRIN KETONE
 0.050U DELTA-BHC
                                                               CHLORDANE (TECH. MIXTURE) /1
                                                         0.50U GAMMA-CHLORDANE
 O. OSOU GAMMA-BHC (LINDANE)
 0.050U HEPTACHLOR
                                                         0.50U
                                                               ALPHA-CHLORDANE
                                                          1.00
                                                               TOXAPHENE
                                                         0.50U
0.50U
0.50U
 0.050U HEPTACHLOR EPOXIDE
                                                               PCB-1016 (AROCLOR 1016)
 0.050U ENDOSULFAN I (ALPHA)
                                                               PCB-1221 (AROCLOR 1221)
                                                               PCB-1232 (AROCLOR 1232)
  O. 10U DIELDRIN
                                                         0.50U PCB-1242 (AROCLOR 1242)
0.50U PCB-1248 (AROCLOR 1248)
  0.10U 4,4'-DDE (P,P'-DDE)
  O 10U ENDRIN
  O.10U ENDOSULFAN II (BETA)
O.10U 4,4' DDD (P,P' DDD)
                                                          1.00 PCB-1254 (AROCLOR 1254)
                                                          1.0U PCB 1260 (AROCLOR 1260)
  O. 10U ENDOSULFAN SULFATE
  0.10U 4.4'-DDT (P.P'-DDT)
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REMARKS

REMARKS

FOOTNOTES *A-AVERÂĞE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *A-AVERAGE VALUE IS ANOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.
*C-CONFIRMED BY GCMS

1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM

EPA-REGION IV ESD, ATHENS, GA. 01/04/91

PURGEABLE ORGANICS DATA REPORT SAMPLE NO. 51691 SAMPLE TYPE: SOIL PROJECT NO. 91-025 PROG ELEM: NSF COLLECTED BY: M GORDON . . SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO ST: FL .. STATION ID: TB-01S COLLECTION START: 10/12/90 0700 STOP: 00/00/00 ** SAS NO : D. NO.: Y324 .. CASE NO.: 15099 .. ANALYTICAL RESULTS UG/KG UG/KG ANALYTICAL RESULTS 11U CHLOROMETHANE 5U 1,2-DICHLOROPROPANE BROMOMETHANE 5U CIS-1.3-DICHLOROPROPENE 110 5U TRICHLOROETHENE (TRICHLOROETHYLENE) 11U VINYL CHLORIDE 11U CHLOROETHANE DIBROMOCHLOROMETHANE 1,1,2-TRICHLOROETHANE METHYLENE CHLORIDE 20U ŠŨ. BENZENE 39 50 ACETONE CARBON DISULFIDE TRANS-1.3-DICHLOROPROPENE 5Ú 1.1-DICHLOROETHENE(1,1-DICHLOROETHYLENE) BROMOFORM 5Ú METHYL ISOBUTYL KETONE 1.1-DICHLOROETHANE 110 METHYL BUTYL KETONE 1,2-DICHLOROETHENE (TOTAL) 110 ŠŬ. CHLOROFORM TETRACHLOROETHENE (TETRACHLOROETHYLENE) 5U 1,2-DICHLOROETHANE 1,1,2,2-TETRACHLOROETHANE 110 METHYL ETHYL KETONE TOLUENE 5U 1,1,1-TRICHLOROETHANE 5Ú CHLOROBENZENE CARBON TETRACHLORIDE ETHYL BENZENE 50 STYRENE 11U VINYL ACETATE BROMODICHLOROMETHANE TOTAL XYLENES 5U PERCENT MOISTURE

REMARKS

REMARKS

F001N01E5

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
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                                  922AA *******
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                                      GERRY LUSTER
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AMAX PHUSPHATE FACILITY, 440660, SURFACE SUIL #01
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Sample ID

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                                 92244 *******
                                                         Type of analysis
                                                                 Report to
                                     CERRY LUSTER
AMAX PHOSPHATE FACILITY, 440569, SURFACE SOIL #06
                                                                  Comments
                                   9:90-55'520-16
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                                      EL:PALMETTO
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                                                               Sample type
                                     842E90 06154
                                                                 Sample ID
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                                    GERRY LUSTER
                                                                Report to
AMAX PHOSPHATE FACILITY, 440573, SURFACE SOIL #07
                                                                 Comments
                                  9:10-88'920-16
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                                      FL:PALMETTO
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842E30 00152

29mple ID

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                                                            Report to
                                GERRY LUSTER
AMAX PHOSPHATE FACILITY, 440645, SEDIMENT #01
                                                             Comments
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                                     15/53/90
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                                     10/54/60
                                                         Receipt date
                             13:32
                                     06/91/01
                                               Collection date, time
                                                          Sample type
                                     SEDIMENT
                                845F90,06733
                                                            Sample ID
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BCI\CMET
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             AS ( 2/25/91) and GL ( 2/25/91)
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                                CERRY LUSTER
                                                           Report to
AMAX PHOSPHATE FACILITY, 440584, SEDIMENT #06
                                                            Comments
                              9:90-05'570-16
                                                          Officer ID's
                                                            Location
                                 FL:PALMETTO
                                    15/53/60
                                                           Flag date
                                                     Completion date
                                    00/0 /0
                                                        Receipt date
                                    10/54/60
                             50:01
                                               Collection date, time
                                    06/11/01
                                                         Sample type
                                    SEDIMENT
                                B42E90 06728
                                                           29mple 1D
```

```
R4SF90.06729
Sample ID
Sample type
                       SEDIMENT
Collection date, time
                       10/17/90
                                 12:30
Receipt date
                       10/24/90
Completion date
                        0/ 0/00
Flag date
                       12/23/90
Location
                       FL: PALMETTO
Other ID's
                       91-025,SD-12:6
Comments
                       AMAX PHOSPHATE FACILITY, 440577, SEDIMENT #12
                       GERRY LUSTER
Report to
                       ****** RA226
 Type of analysis
                                            *******
 Verified by
                      AS ( 2/25/91) and GL ( 2/25/91)
 Date, time counted
                       2/14/91
                                  0:00
                       1000 min
 Length of count
 Preparer
                       ACJB
 Counting system
                       LCH
 Sample size
                         0.500000 GASH
 Comments
   NUCLIDE
              ACTIVITY
                         2 SIG ERROR
                                         UNITS
                                                  DATE
   RA-226
              7.9400E+00
                              1.00 %
                                      PCI/GASH
                                                 10/17/90
   RA-226
              7.3600E+00
                              1.00 %
                                      PCI/GDRY
                                                 10/17/90
   RA-226
              4.7400E+00
                              1.00 %
                                      PCI/GWET
                                                 10/17/90
Type of analysis
                       ****** RA228
                                            *******
 Verified by
                      AS (3/13/91) and GL (3/13/91)
 Date, time counted
                        3/ 5/91
                                  9:55
 Length of count
                        100 min
 Preparer
                       ZS
 Counting system
                       281
                         0.500000 GASH
 Sample size
 Comments
   NUCLIDE
                         2 SIG ERROR
              ACTIVITY
                                        UNITS
                                                  DATE
                                                  3/ 5/91
   RA-228
             -7.8590E-01
                            127.88 %
                                      PCI/GASH
   RA-228
             -7.2760E-01
                            128.00 %
                                      PCI/GDRY
                                                 10/17/90
   RA-228
             -4.6890E-01
                            128.00 %
                                      PCI/GWET
                                                 10/17/90
```

```
Sample ID
                      R4SF90.06732
Sample type
                      WATER
Collection date, time 10/16/90
                               16:25
Receipt date
                      10/24/90
Completion date
                       3/14/91
Flag date
                      12/23/90
                      FL:PALMETTU
Location
                      91-025, TW-01:2
Other ID's
                      AMAX PHOSPHATE FACILITY, 440679, TEMPORARY WELL #01
Comments
Report to
                      GERRY LUSTER
                      ****** ALPHA
                                          *******
Type of analysis
                     GL ( 1/ 3/91) and GL ( 1/ 3/91)
 Verified by
                      11/ 8/90
 Date, time counted
                                 9:59
 Length of count
                      100 min
 Preparer
                      A C
 Counting system
                      T182
                        0.050000 L
 Sample size
                       746.0 MG/L WT= 37.30 GCPM=
 Comments
                                                     1.17 BCPM=0.12 ABS FACT
   NUCLIDE
             ACTIVITY
                        2 SIG ERROR UNITS
                                               DATE
   ALPHA
             5.3800E+01
                            21.64 %
                                     PCI/L
                                               11/ 8/90 EFF= 0.192
                     ******* RA226
Type of analysis
                                          *******
                     GL ( 1/ 3/91) and GL ( 1/ 3/91)
 Verified by
Date, time counted
                    12/18/90
                                0:00
 Length of count
                      1000 min
 Preparer
                      ACIB
 Counting system
                      LCJ
 Sample size
                        0.200000 L
 Comments
   NUCLIDE
             ACTIVITY
                        2 SIG ERROR
                                       UNITS
                                               DATE
   RA+226
             7.3200E+00
                             2.00 % PCI/L
                                               10/16/90
                      ****** HA228
                                          *******
Type of analysis
                     AS (3/14/91) and GL (3/14/91)
 Verified by
 Date, time counted
                       2/28/91
                                9:59
 Length of count
                       100 min
 Preparer
                      ZS
                      2B2
 Counting system
                        0.200000 L
 Sample size
 Comments
                        2 SIG ERROR
   NUCLIDE
             ACTIVITY
                                       UNITS
                                                DATE
                            87.51 % PCI/L
                                                2/28/91
   RA-228
             2.4250E+00
                      ****** BETA
Type of analysis
                                          *******
 Verified by
                     GL (1/3/91) and GL (1/3/91)
 Date, time counted
                      11/ 8/90
                                 9:59
                      100 min
 Length of count
 Preparer
                      AC
                      T2B2
 Counting system
 Sample size
                        0.050000 L
                                                     3.60 BCPM=0.79 ABS FACT
 Comments
                       746.0 MG/L WT= 37.30 GCPM=
                        2 SIG ERROR
                                       UNITS
                                               DATE
   NUCLIDE
             ACTIVITY
```

14.91 % PCI/L

6.0270E+01

11/ 8/90 EFF= 0.420

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11\ 8\80 ELE= 0°450
                                     5CI\r
                                             21.23 %
                                                          1 *8220E+01
                                                                          REIV
                                   CIINO
                                             S RIC ERROR
                                                           ACTIVITY
                                                                       NUCLIDE
                           DATE
2.55 BCPM=0.82 ABS FACT=
                              SREO"O WC/F MI=SRE°00 CCBW=
                                                                        Comments
                                              0°100000 r
                                                                     azīs aīdwes
                                                                 Counting system
                                                      IVZI
                                                                        Preparer
                                                        DA
                                                  TOO WIN
                                                                 rendry or conur
                                                              Date, time counted
                                           65:6
                                                  06/8 /11
                           CT ( 1 3 3 3 1) 9 PUP ( 1 3 3 3 1 ) TO
                                                                     Verified by
                                                                 Ivpe of analysis
                                           *******
                           *******
                                             % SS**9
                                                          1°1630E+00
                        16/EI/E
                                     PCI/L
                                                                        87Z-V8
                           DATE
                                   STIND
                                             S 21C ERRUR
                                                           ACTIVITY
                                                                       NUCLIDE
                                                                       · sinsmmoD
                                              0°40000 F
                                                                     azis atdues
                                                                 Counting system
                                                       182
                                                        SZ
                                                                        Preparer
                                                  UTW OOT
                                                                 reudry of count
                                           10:43
                                                 3/13/81
                                                             Date, time counted
                           CT ( 3/50/61) gup 42 ( 3/50/61)
                                                                     Veritted by
                                                                 Type of analysis
                                          **********
                                             1.00 %
                       06/91/01
                                     BCI\r
                                                          1 º 6430E+01
                                                                        87-88
                                             S 2IC EBBOB
                                                           ACTIVITY
                           DATE
                                   STINU
                                                                       NUCLIDE
                                                                        Comments
                                              7 00000t 0
                                                                     Sample size
                                                       CCE
                                                                 Counting system
                                                      ACIB
                                                                        Preparer
                                                  TOOC WID
                                                                 rendry or count
                                                              Date, time counted
                                                  06/9 /21
                                           00:0
                           Cr (15/18/60) 9UQ Cr (15/18/60)
                                                                     Verified by
                                                                 Iype of analysis
                                         92248 *******
            11/ 8/80 EEE= 0.078
                                     PCI/L
                                             8 05°20
                                                         4.4580E+01
                                                                         AHGJA
                                            S RIC ERROR
                                   SIINN
                           DATE
                                                           ACTIVITY
                                                                       MUCLIDE
0.39 BCPM=0.07 ABS FACT
                              520000 WC\T MI=520000 CCbW=
                                                                        Comments
                                              0°100000 T
                                                                     azīs aldues
                                                                 Counting system
                                                      IAST
                                                        DΑ
                                                                        Preparer
                                                  UTW OUT
                                                                 rendry of count
                                                             Date, time counted
                                          65:6
                                                  06/8 /11
                           (16/E /1 ) no pue (16/E /1 ) no
                                                                     Verified by
                                         ********
                                                                 Type of analysis
                           *******
                                              GERRY LUSTER
                                                                         Report to
         WWAX PHOSPHATE FACILITY, 440673, MONITOR WELL #03
                                                                          Comments
                                           01-052 WM-03:5
                                                                        ofher ID's
                                               FL:PALMETIO
                                                                          Location
                                                  15/53/60
                                                                         Flag date
                                                  3/50/61
                                                                   Completion date
                                                  10/54/60
                                                                      Receipt date
                                                            Collection date, time
                                          00:6
                                                  06/91/01
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Sample type

gi ətdwes

MATER

842E30 06156

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Sample ID
                       R4SF90.06727
Sample type
                      WATER
Collection date, time 10/16/90
Receipt date
                      10/24/90
Completion date
                       3/19/91
flaq date
                      12/23/90
Location
                      FL:PALMETTO
Other ID's
                      91-025, Mw-06:2
Comments
                      AMAX PHOSPHATE FACILITY, 440685, MONITOR WELL #06
Report to
                      GERRY LUSIER
 Type of analysis
                      ******** ALPHA
                                          *******
 Verified by
                     GL ( 1/ 3/91) and GL ( 1/ 3/91)
 Date, time counted 11/8/90
                                9:59
                       100 min
 Length of count
 Preparer
                      AC
 Counting system
                      T2A2
 Sample size
                        0.100000 L
 Comments
                        328.0 MG/L WT= 32.80 GCPM=
                                                      0.21 BCPM=0.14 ABS FACT
   NUCLIDE
             ACTIVITY
                        2 SIG ERROR
                                      UNITS
                                               DATE
   ALPHA
             1.754UE+00
                           169.04 % PCI/L
                                               11/ 8/90 EFF= 0.194
                      ***** RA226
Type of analysis
                                          *******
                     GL ( 1/ 3/91) and GL ( 1/ 3/91)
 Veritied by
                      12/18/90
 Date, time counted
                                 0:00
 Length of count
                      1000 min
 Preparer
                      ACIB
 Counting system
                      LCH
 Sample size
                           1.000 L
 Comments
                        2 SIG ERROR
   NUCLIDE
             ACTIVITY
                                       UNITS
                                               DATE
   RA-226
             1.1300E+00
                             3.00 % PCI/L
                                               10/16/90 A
Type of analysis
                      ******** RA228
                                          *******
                     AS (3/14/91) and GL (3/14/91)
 Verified by
 Date, time counted
                       2/28/91
                                9:59
 Length of count
                       100 min
 Preparer
                      zs
 Counting system
                      2A4
                           1,000 L
 Sample size
 Comments
   NUCLIDE
             ACTIVITY
                        2 SIG ERRUR
                                      UNITS
                                                DATE
                                                2/28/91 A
   RA-228
             5.2630E-01
                            81.00 % PCI/L
                                          *******
Type of analysis
                      ***** BETA
                     GL ( 1/ 3/91) and GL ( 1/ 3/91)
 Verified by
 Date, time counted
                      11/ 8/90
                                9:59
 Length of count
                       100 min
 Preparer
                      AC
 Counting system
                      T2A2
 Sample size
                        0.100000 L
 Comments
                       328.0 MG/L WT= 32.80 GCPM=
                                                      1.90 BCPM=1.00 ABS FACT
   NUCLIDE
             ACTIVITY
                        2 SIG ERROR
                                       UNITS
                                                DATE
                                               11/ 8/90 EFF= 0.420
                                    PCI/L
   BETA
             9.6530E+00
                            37.84 %
Type of analysis
                      ***** RA226
                                          *******
                     JB ( 1/ 8/91) and GL ( 1/ 8/91)
 Verified by
 Date, time counted
                      1/ 7/91
                                 0:00
                      1000 min
 Length of count
 Preparer
                      ACIB
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* 11.06 10-30$LL.b-
8 16/81/E
              BCI\P
                                              825-A9
                     S RIC ERRUR
    DATE
            STINU
                                ACTIVITY
                                              MUCLIDE
                                 6
                                               Comments
                      1 000 T
                                            ezis elames
                               185
                                        Counting system
                                SZ
                                               Preparer
                                        rendry of count
                          ulm ool
                                     Date, time counted
                   3/18/91 10:03
     (16/61/E ) SA bnb (19/61/E ) JD
                                           Verified by
                                       Type of analysis
                  ********
     ******
9 06/91/01
              3,00 % PCI/L
                                1 0200E+00
                                              4A-226
                     ACTIVITY 2 SIG ERRUR
    DATE
            SIINO
                                              NUCLIDE
                                 8
                                               Comments
                      7 000 r
                                            Sample size
                                       Counting system
                               100
```

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II\ 8\80 ELE= 0'450
                                           18 02 8
                                                       4.5470E+01
                                                                        BETA
                                   PCI/L
                                           S 21C EKKOK
                                                         ACTIVITY
                                                                     MUCLIDE
                         DATE
                                  STIND
                            3108°0 WC/L WT=185.40 GCPM=
3°13 RCBW=1°01 VR2 EVCI
                                                                      Comments
                                            0°020000 r
                                                                   azīs aīdwes
                                                    EAST
                                                               Counting system
                                                                      Preparer
                                                      JA
                                                TOO WID
                                                             rength of count
                                                           Date, time counted
                                         65:6
                                                06/8 /11
                                                                   Veritted by
                         CT ( 1 3 3 1) Sug CL ( 1 3 3 1)
                                                               Type of analysis
                                         *******
                         *****
                                           18 35 8
                                                       2°1500E-01
                      16/21/8
                                    BCINT
                                                                      87Z-78
                                           S RIC ERROR
                                                                     NUCLIDE
                         DATE
                                  SIINN
                                                        ACTIVITY
                                                                      Comments
                                            7 000°T
                                                                   azīs atawes
                                                               Counting system
                                                     EAI
                                                                      Preparer
                                                      SZ
                                                UTW OOT
                                                               rength of count
                                                           Date, time counted
                                         3/12/91 14:27
                         Y2 ( 3/14/61) 9PA GL ( 3/14/91)
                                                                   Veritted by
                                                              Type of analysis
                                        ********
                         *******
                      06/91/01
                                    SCI\P
                                           $ 00°b
                                                        10-30001°9
                                                                      922-V8
                                           S 2IC EKKOK
                                                        ACTIVITY
                         DATE
                                  STINU
                                                                     MUCLIDE
                                                                      Comments
                                            1 000° I
                                                                   azis aidmes
                                                     LCA
                                                               Counting system
                                                    ACIB
                                                                      Preparer
                                                TOUG WIL
                                                               rendry of count
                                                           Date, time counted
                                         00:0
                                                13/13/60
                         Cr (15/18/80) guq Cr (15/18/80)
                                                                   Verified by
                                                              Type of analysis
                                        ********
                         ******
           11\ 8\80 ELE= 0'155
                                    PCI/L
                                           $ 68.10
                                                       -1 * 6560E+01
                                                                       AHGIA
                                           S 2IC EKKOK
                                  SIINA
                                                         ACTIVITY
                                                                     MUCLIDE
                         DATE
O'IE BCPM=0.31 ARS FACT
                            3108°0 WC/P MI=182°40 CC6W=
                                                                      Comments
                                            7 000050 0
                                                                   azis alames
                                                    EAST
                                                              Counting system
                                                      DA
                                                                      Preparer
                                                TOO WIL
                                                               rendry of count
                                                           Date, time counted
                                         65:6
                                                06/8 /11
                         (16/F /1 ) 79 pup (16/E /1 ) 79
                                                                   Verified by
                                        ********
                                                              Type of analysis
                                                                       Report to
                                            GERRY LUSTER
       AMAX PHOSPHATE FACILITY, 440656, SURFACE WATER #01
                                                                        Comments
                                          1:10-MS'SZ0-16
                                                                      Ofher ID's
                                             OTTBM149:13
                                                                        Location
                                                15/53/80
                                                                       Flag date
                                                                Completion date
                                                16/01/8
                                                                    Receipt date
                                                10/54/60
                                         13:30
                                                06/91/01
                                                          Collection date, time
                                                                     Sample type
                                                   MATER
```

R45F90.06730

Sample ID

```
$ 05 81
                                                        4.5470E+01
                                                                         AT38
           11\ 8\30 ELE= 0°450
                                    PCI/L
                                            S RIC ERROR
                          DATE
                                  STINU
                                                          ACTIVITY
                                                                      NUCLIDE
                             30000 MG/L WT=183,00 GCPM=
                                                                       Comments
5°64 RCbw=0'85 VB2 EVCI:
                                             7 000050°0
                                                                    azīs aidmes
                                                     TZA4
                                                                Counting system
                                                                       Preparer
                                                       V
                                                                rendeh of count
                                                 TOO WIL
                                                 06/8 /11
                                                            Date, time counted
                                          6516
                          CT ( I\ 3\8I) SUG CT ( I\ 3\8I) TO
                                                                    Veritted by
                                                                Type of analysis
                                          ********
                          *****
                                            % E8°S8
                                                        2°5800E-01
                       3/15/61
                                     5CI\r
                                                                       872-48
                          DATE
                                   STIND
                                            S 2IC EBBOB
                                                          ACTIVITY
                                                                      MUCLIDE
                                                                       Соппепта
                                             1 000 T
                                                                    azīs aldmes
                                                                Counting system
                                                      PAI
                                                       SZ
                                                                       Preparer
                                                                rendth of count
                                                 UTW OOL
                                          14:57
                                                3/15/61
                                                            Date, time counted
                                                                    Verified by
                          AS ( 3/14/91) and GL ( 3/14/91)
                                                                Type of analysis
                          ******
                                         8224A *******
                                            $ 00°b
                                                        2°4000E-01
                       06/91/01
                                     PCI/L
                                                                       922-49
                                            S RIC ERROR
                          DATE
                                   SIINN
                                                         ACTIVITY
                                                                      MUCLIDE
                                                                       Comments
                                             1 000 T
                                                                    azts atdues
                                                                Counting system
                                                      CCB
                                                     ACIB
                                                                       Preparer
                                                 TOUG WIL
                                                                rendry of count
                                                            Date, time counted
                                          00:0
                                                 06/81/21
                          CC (15/18/80) SPG CC (15/18/80)
                                                                    Verified by
                                         ********
                                                                Type of analysis
                          ******
            II\ 8\80 ELE= 0°IS3
                                            534 22 8
                                                        2°0480E+00
                                     BCINE
                                                                        AHGJA
                                            S RIC ERROR
                          DATE
                                  SIINN
                                                          ACTIVITY
                                                                      MOCFIDE
                                                                       Comments
0°13 BCbW=0°09 VB2 EVCI
                             30000 MG/L WI=183,00 GCPM=
                                                                    eample size
                                             0.000000
                                                                Counting system
                                                     12 A 4
                                                       DA
                                                                       Preparer
                                                 INO WIL
                                                                rendry of count
                                                            Date, time counted
                                          65:6
                                                 06/8 /11
                          (16/E /I ) 75 PUP (16/E /I ) 75
                                                                    Verified by
                                                                Type of analysis
                                         ********
                                             CERRY LUSIER
                                                                        Report to
        AMAX PHOSPHATE FACILITY, 440656, SURFACE WATER #01
                                                                         Comments
                                           1:10-MS'SZO-16
                                                                       ofner ID's
                                                                         Location
                                              FL:PALMETTO
                                                 15/53/60
                                                                        Flag date
                                                                  Completion date
                                                 16/91/8
                                                 06/72/01
                                                                     Receipt date
                                                           Collection date, time
                                          13:30
                                                 06/91/01
```

RAIER

842E00 06130X

Sample type

Sample ID

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Sample ID
                      R4SF90.06731
Sample type
                      WATER
Collection date, time 10/16/90
                               14:40
Receipt date
                      10/24/90
Completion date
                       0/ 0/00
                      12/23/90
Flag date
Location
                      FL:PALMETTO
Other ID's
                      91-025.SW-06:1
Comments
                      AMAX PHOSPHATE FACILITY, 440590, SURFACE WATER #06
Report to
                      GERRY LUSTER
Type of analysis
                      ******** ALPHA
                                          *******
                     GL (1/3/91) and GL (1/3/91)
 Veritied by
                    11/ 8/90
                                 9:59
 Date, time counted
 Length of count
                      100 min
 Preparer
                      A C
 Counting system
                      T2B1
 Sample size
                        0.100000 L
 Comments
                       980.0 MG/L WT= 98.00 GCPM= 0.24 BCPM=0.10 ABS FACT
   NUCLIDE
                        2 SIG ERROR
                                               DATE
             ACTIVITY
                                      UNITS
   ALPHA
             5.3020E+00
                            83.31 % PCI/L
                                               11/ 8/90 EFF= 0.153
Type of analysis
                      ******* RA228
                                          *******
 Verified by
                     AS (3/14/91) and GL (3/14/91)
 Date, time counted
                       2/28/91
                                9:59
                       100 min
 Length of count
 Preparer
                      ZS
 Counting system
                      281
                           1,000 L
 Sample size
 Comments
                        2 SIG ERROR
   NUCLIDE
             ACTIVITY
                                       UNITS
                                                DATE
             2.8620E-01
                           181.90 % PCI/L
                                                2/28/91
   RA-228
Type of analysis
                      ****** BETA
                                          *******
                     GL (1/3/91) and GL (1/3/91)
 Verified by
                      11/ 8/90
                                 9:59
 Date, time counted
                       100 min
 Length of count
 Preparer
                      AC
 Counting system
                      T2B1
                        0.100000 L
 Sample size
                       980.0 MG/L WT= 98.00 GCPM=
                                                     1.49 BCPM=0.78 ABS FACT
 Comments
                        2 SIG ERROR
                                       UNITS
                                               DATE
   NUCLIDE
             ACTIVITY
                                               11/ 8/90 EFF= 0.420
   BETA
             7.6150E+00
                            42.44 % PCI/L
                      ***** RA226
                                          *******
Type of analysis
 Verified by
                     JB ( 1/ 8/91) and GL ( 1/ 8/91)
                                0:00
 Date, time counted
                      12/18/90
                      1000 min
 Length of count
 Preparer
                      ACIB
 Counting system
                      LCI
                           1,000 L
 Sample size
 Comments
                        2 SIG ERROR
                                       UNITS
                                                DATE
   NUCLIDE
             ACTIVITY
   RA-226
             1.8500E+00
                             2.00 % PCI/L
                                               10/16/90
```

APPENDIX C



Site Inspection Report

ŞEPA

POTENTIAL HAZARDOUS WASTE SITE SITE INSPECTION REPORT

I. IDENT	I. IDENTIFICATION						
01 STATE	02 SITE NUMBER						
1-6	D043055151						

PART 1	SITE LOCATION AND INSPECTION INFO	RMATION LTL	D04305515
II. SITE NAME AND LOCATION			
OT SITE NAME Level tampon or describive name at site! AMAX Phosphost Fo	rulity P.O. Box 13		
Palmetto	04 STATE 05 ZIP CODE FL 3422 (o Manate	07COUNTY 08 CONG CODE DIST
22 37 24. 82 31 54	10 TYPE OF OWNERSHIP (Check one) A. PRIVATE B. FEDERAL F. OTHER	C. STATE C. D. COUNTY	
III. INSPECTION INFORMATION O1 DATE OF INSPECTION 02 SITE STATUS	03 YEARS OF OPERATION		
10 16 90 BACTIVE	1966 pro		
D4 AGENCY PERFORMING INSPECTION (Check as that apply) A. EPA	G C MUNICIPAL G	D. MUNICIPAL CONTRACTOR	
☐ A. EPA ☐ E. STATE ☐ F. STATE CONTRACTOR	·Name of limi ☐ G. OTHER_	D. MUNICIPAL CONTRACTOR	Name of 'rm)
05 CHIEF INSPECTOR	Name of tims OB TITLE	(Specify) 07 ORGANIZATION	08 TELEPHONE NO.
Maureen Gordon Ph	D Chemist	NUS	1404 938-771
09 OTHER INSPECTORS	I 10 TITLE	11 ORGANIZATION	12 TELEPHONE NO.
leary Sanges	Geol ogist	NUS	()
Andy Spanish	Technician	NUS	()
Ron Young	Technician	NUS	()
Mark Adams	Technician	NUS	()
			()
TVGN NGNCS	Environ Abo	One	18 TELEPHONE NO 1813 7-22-45
			()
			()
			()
		·····	()
			()
17 ACCESS GAINED BY	19 WEATHER CONDITIONS		
IV. INFORMATION AVAILABLE FROM			
IVan Nance	102 OF (Agency Organization) ROYSTEC PHOE OS AGENCY OB ORGANIZATION	sishate Inc	03 TELEPHONE NO. (813) 722 45
Mayreen Goodin	MD EPA NUS	404938-7710	08 0ATE 11 91 MON 1 12 1 EAR

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		AST			_
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POTENTIAL HAZARDOUS WASTE SITE SITE INSPECTION REPORT

I. IDENTIFICATION					
OFSTATE	DOU 302215				

ACI	A			E INFORMATIO	N	FU DO	H 3022 12
II. WASTES	TATES, QUANTITIES, AN	D CHARACTER	ISTICS		···		
ASCLID		TONS .	of waste quantities independent.	D3 WASTE CHARAC	OSIVE FINFER	UBLE : HIGHLY OTHOUS : J EXPLO MMABLE K REAC	IVE PATIBLE
III. WASTE T		NO OF DROMS		<u> </u>			
CATEGORY	SUBSTANCE N	AME	01 GROSS AMOUNT	02 UNIT OF MEASUR	E 03 COMMENTS		
SLU	SLUDGE		OT GROSS AMOGRA	OZ ONIV OF WEAGON	C 03 COMMENTS		
OLW	OILY WASTE						
SOL	SOLVENTS		 	 	 		
PSD	PESTICIDES						
occ	OTHER ORGANIC CH	IEMICALS	 		 		
10C	INORGANIC CHEMIC		750 to	nsiday	DAP		
ACD	ACIDS		2000 ton	had a sta	En 54	2 tons/do	11 P DE
BAS	BASES		2000	7/2009 11/2	194 y 24	= 1.57.57 (20	4 . 3 . 5
MES	HEAVY METALS			 			
V. HAZARD	OUS SUBSTANCES IS AP	pendix for most frequent	try cited CAS Numbers				
1 CATEGORY	02 SUBSTANCE NA	AME	03 CAS NUMBER	04 STORAGE DIS	SPOSAL METHOD	05 CONCENTRATION	06 MEASURE OF
ACO	SULFUNIC	Cicio		265-11	<u></u>	 	GONGENTIANO
-11×-	QG 226 R	122 B		ING	MOSUM		
	7	A. CCS		tanis	7 103017	 	
	727			1		 	
	ain an	hydno	5 - (30m S	talles			1
	HE from	0 000		- Clara	18	 	
	(1) V 1051 100	-(0.5	0.0	Stat		 	
	- O I S P SCIEN	1	1	3700		 	
						 	
				 		 	
		 	 				
	·					<u> </u>	
							
			 			 	
	 		 	 		 	
			 			 	
			1	L		<u> </u>	ــــــــــــــــــــــــــــــــــــــ
	CKS See Assend & SKCAS Numbe	751	,				
CATEGORY	OI FEEDSTOCK	NAME	02 CAS NUMBER	CATEGORY	01 FEEDST	OCK NAME	02 CAS NUMBER
FDS				FDS			
FDS				FDS			
FDS				FDS			
FDS			<u> </u>	FDS	<u></u>		
/I. SOURCES	OF INFORMATION (Cités	pecific references, e.g.,	state ides, sample analysis.	ecorts:			
F	ile inf	omat	im, li	ntecvi	eW		

\$EPA

POTENTIAL HAZARDOUS WASTE SITE SITE INSPECTION REPORT

	TIFICATION ·
01 STATE	02 SITE NUMBER

	AZARDOUS CONDITIONS AND INCIDENTS
II, HAZARDOUS CONDITIONS AND INCIDENTS (Continued)	
01 I J. DAMAGE TO FLORA 04 NARRATIVE DESCRIPTION	02 OBSERVED (DATE) POTENTIAL ALLEGED
Stressed reget	whin noted around plant.
01 T. K. DAMAGE TO FAUNA	02 - OBSERVED (DATE:) POTENTIAL - ALLEGED
04 NARRATIVE DESCRIPTION include nameral of species? Cottle eastil Sich.	ng foliage would get
01 = L. CONTAMINATION OF FOOD CHAIN 04 NARRATIVE DESCRIPTION COUNTY And	02 I OBSERVED (DATE:) ** ** ** ** ** ** ** ** ** ** ** ** **
01 _ M. UNSTABLE CONTAINMENT OF WASTES 'Spirts Runoil Standing inquids: Leading drums'	02 TOBSERVED (DATE:) SPOTENTIAL TALLEGED
03 POPULATION POTENTIALLY AFFECTED: WOLD	104 NARRATIVE DESCRIPTION LEE 610WM CM WIND
01 C N. DAMAGE TO OFFSITE PROPERTY	02 COBSERVED (DATE:) C POTENTIAL CALLEGED
04 NARRATIVE DESCRIPTION	A in Calipage
Fluoride foun	u in follage,
01 _ O. CONTAMINATION OF SEWERS, STORM DRAINS WWTPs 04 NARRATIVE DESCRIPTION	02 TOBSERVED (DATE:) POTENTIAL TALLEGED
None obse	erved.
01 T P ILLEGAL:UNAUTHORIZED DUMPING 04 NARRATIVE DESCRIPTION	02 T OBSERVED (DATE:) T POTENTIAL T ALLEGED
Everything is pe	ermitted.
05 DESCRIPTION OF ANY OTHER KNOWN, POTENTIAL, OR ALLE	
from stades.	fumes and particles
III. TOTAL POPULATION POTENTIALLY AFFECTED:	
IV. COMMENTS	
V. SOURCES OF INFORMATION (Cité specific references, e.g. state tiles.	
tile and inte	sview. Site investigation.

POTENTIAL HAZARDOUS WASTE SITE

I. IDENTIFICATION

SITE INSPECTION REPORT PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS 01 STATE 02 SITE NUMBER DO 43055 5
II. HAZARDOUS CONDITIONS AND INCIDENTS
01 A. GROUNDWATER CONTAMINATION 02 _ OBSERVED (DATE:) POTENTIAL _ ALLEGED 03 POPULATION PGTENTIALLY AFFECTED: 04 NARRATIVE DESCRIPTION
People use gw for potable source
and irrigation.
01 B. SURFACE WATER CONTAMINATION 02 II OBSERVED (DATE:) GODE TO THE STREET OF THE STREE
From runoff through ditches
01 C. CONTAMINATION OF AIR 02 C OBSERVED IDATE. 03 POPULATION POTENTIALLY AFFECTED: 04 NARRATIVE DESCRIPTION 05 CULTION 06 CULTION 07 C CONTAMINATION OF AIR 07 C CONTAMINATION OF AIR 08 C CONTAMINATION OF AIR 09 C C CONTAMINATION OF AIR 09 C C C C C C C C C C C C C C C C C C C
relacised from stades.
01 _ D. FIRE EXPLOSIVE CONDITIONS 02 _ OBSERVED (DATE:) POTENTIAL _ ALLEGED 03 POPULATION POTENTIALLY AFFECTED 04 NARRATIVE DESCRIPTION
No flammables.
01 _ E. DIRECT CONTACT
From Lunes. Hirborne gypsum.
From trespasser - no fence on south.
01 F CONTAMINATION OF SOIL 02 OBSERVED (DATE:
From aichorne material or spills.
01 I.G. DRINKING WATER CONTAMINATION 02 II OBSERVED (DATE) I
From que contamination.
01 TH WORKER EXPOSURE:INJURY 02 IT OBSERVED (DATE:) IT POTENTIAL ALLEGED 03 WORKERS POTENTIALLY AFFECTED. 04 NARRATIVE DESCRIPTION
From accidents.
01 DI POPULATION EXPOSURE/INJURY 02 DOSERVED (DATE.) DOTENTIAL DALLEGED 03 POPULATION POTENTIALLY AFFECTED: 04 NARRATIVE DESCRIPTION
From runoff or carried by air or
gw contamination.

\$EPA	POTENTIAL S PART 4 - PERMIT	_	1. IDENTIFICATION 01 STATE 02 SITE NUMBER FL DOY SOSS 15		
II. PERMIT INFORMATION					
Of TYPE OF PERMIT ISSUED	02 PERMIT NUMBER	03 DATE ISSUED	04 EXPIRATION DATE		
	unlengen	3/82	-	lone	outfall used in
B. UIC	granuan	107		-	- 11 10 00 DO 11
_ C. AIR	-				
D. RCRA				 	
E. RCRA INTERIM STATUS				 	
F SPCC PLAN					
IG STATE Species				-	
TH. LOCAL Scecity.					
II. OTHER Scenty,		-		1	
J NONE					······································
III. SITE DESCRIPTION			<u> </u>	<u> </u>	
C DRUMS, ABOVE GROUND D. TANK, ABOVE GROUND E. TANK, BELOW GROUND F. LANDFILL G. LANDFARM H. OPEN DUMP I. OTHER 500000000000000000000000000000000000		☐ D. ☐ €. ☐ F. ☐ €.	CHEMICAL PHYSIC BIOLOGICAL WASTE OIL PROCES SOLVENT RECOVER OTHER RECYCLING OTHER	SSING RY	PILITS DB AREA OF SITE GTO Acres,
V. CONTAINMENT					
01 CONTAINMENT OF WASTES Check one) A. ADEQUATE, SECURE	MODERATE	C. INADEQU	JATE, POOR	□ D. INSEC	URE, UNSOUND, DANGEROUS
oz description of drums. Diking. Liners. E A drui Ghadha	nag dif	ch su	nound	ls gy	1PS4m
V. ACCESSIBILITY	· · · · · · · · · · · · · · · · · · ·			· · · · · · · · · · · · · · · · · · ·	
21 WASTE BASILY ACCESSIBLE. TYES		unce,	ned s	South	arn borde

VI. SOURCES OF INFORMATION Cité specific references, e.g. state files, samole enalysis, reports)

Site investigation. File moderne.

				<u> </u>			
SEPA	POTENTIAL HAZARDOUS WASTE SITE SITE INSPECTION REPORT			1. IDENTIFICATION 01 STATE 02 SITE NUMBER			
YEFA	PART 5 - WATER	Fr 10043055151					
II. DRINKING WATER SUPPLY							
01 TYPE OF DRINKING SUPPLY		02 STATUS			03 DISTANCE TO SITE		
Слеск as adoxicable) SURFACE	WELL	ENDANGERE	D AFFECTED	MONITORED			
COMMUNITY A. 1	B. □	A. =	в. 🗆	c. 🗆	A(mi)		
NON-COMMUNITY C. I	. 0.12	0.17	E. C	F. 🖸	B. <u>50' (</u> mi)		
III. GROUNDWATER 31 GROUNDWATER USE IN VICINITY (Crock)							
(A. ONLY SOURCE FOR DRINKING	B DRINKING FORMER SOURCES SYMMET	DUSTRIAL, IRRIGATION	'Limited other	IIAL. INDUSTRIAL, IRRIGAT Sources avakable;	TION I D. NOT USED, UNUSEABLE		
02 POPULATION SERVED BY GROUND WA	TER 1942 (U	Vithin 4mi	03 DISTANCE TO NEA	REST DRINKING WATER V	VELL 50 (mi)		
04 DEPTH TO GROUNDWATER (ft)	05 DIRECTION OF GRO	OUNDWATER FLOW PS +	06 DEPTH TO AQUIFE OF CONCERN	R 07 POTENTIAL YIEL OF AQUIFER	08 SOLE SOURCE AQUIFER (gpd) SYES SHO		
Most are shallow private wells. Resident to wait to water to be south of their potable water to water to wait was country (Sw).							
TO RECHARGE AREA TYES COMMENTS NO			TO DISCHARGE AREA TYES COMM NO	ENTS			
IV. SURFACE WATER		<u> </u>					
O1 SURFACE WATER USE: Check Shell TA. RESERVOIR, RECREATION DRINKING WATER SOURCE		N. ECONOMICALLY TRESOURCES	□ С. СОММЕР	RCIAL. INDUSTRIAL	☐ D. NOT CURRENTLY USED		
02 AFFECTED/POTENTIALLY AFFECTED BODIES OF WATER							
NAME:	_			AFFECTED	DISTANCE TO SITE		
Bishop Harbos = 22							
Little ma	note R	ive		C 			
V. DEMOGRAPHIC AND PROPERT	Y INFORMATION						
01 TOTAL POPULATION WITHIN	02 DISTANCE TO NEAR				ST POPULATION		
_ `_ `	NO OF PERSONS		MILES OF SITE		1 (mi)		
03 NUMBER OF BUILDINGS WITHIN TWO (2	MILES OF SITE		04 DISTANCE FO NEA	REST OFF SITE BUILDING	50 (mi)		
DS POPULATION WITHIN VICINITY OF SITE.				ça. Jansaiy populated urban are)		
agrilu Some	Henry	spurs	ely ,	aspula	Je d,		

EPA FORM 2070-13 (7-81)

POTENTIAL HAZARDOUS WASTE SITE

1. IDENTIFICATION

PART 5 - WATER, DEMOGRAPHIC, AND ENVIRONMENTAL DATA
VI. ENVIRONMENTAL INFORMATION
01 PERMEABILITY OF UNSATURATED ZONE "Chece one"
. A. 10-7 - 10-3 cm/sec
02 PERMEABILITY OF BEDROCK Checkone.
☐ A, IMPERMEABLE ☐ B, RELATIVELY IMPERMEABLE ☐ C. RELATIVELY PERMEABLE ☐ D. VERY PERMEABLE ☐ D. VERY PERMEABLE ☐ Greater than 10 ⁻² cm sec)
23 DEPTH TO BEDROCK 04 DEPTH OF CONTAMINATED SOIL ZONE 05 SOIL DH
OF ONE YEAR 24 HOUR RAINFALL OBSCOPE SITE SLOPE DIRECTION OF SITE SLOPE TERRAIN AVERAGE SLOPE O 1 0%
SITE IS IN
11 DISTANCE TO WETLANDS (5 acre minimum) 12 DISTANCE TO CRITICAL HABITAT (of endangered species)
ESTUARINE OTHER
A ONSITMI) B. (mi) ENDANGERED SPECIES: Flooda Mantel
13 LAND USE IN VICINITY
DISTANCE TO:
RESIDENTIAL AREAS; NATIONAL/STATE PARKS, AGRICULTURAL LANDS COMMERCIAL/INDUSTRIAL FORESTS, OR WILDLIFE RESERVES PRIME AG LAND AG LAND
A(mi) B(mi) C(mi) D(mi)
14 DESCRIPTION OF SITE IN RELATION TO SURROUNDING TOPOGRAPHY
Terrain is relatively flat. Highest point in area v 30 ams/
11:0 -1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Highest point in alex 20 30 ms/
VII. SOURCES OF INFORMATION (Cite specific references, e.g., state tres, sample analysis, reports)
Tila Pala

	P	OTENTIAL HAZARDOUS WASTE SITE	I. IDENTIFICATION
\$EPA		SITE INSPECTION REPORT RT 8 - SAMPLE AND FIELD INFORMATION	DOY 3055 151
II. SAMPLES TAKEN			
SAMPLE TYPE	01 NUMBER OF SAMPLES TAKEN	02 SAMPLES SENT TO	03 ESTIMATED DATE RESULTS AVAILABLE
GROUNDWATER	10	SWOK Broken A	YOU OK
SURFACE WATER	9	Gulf South En	ironmental,
WASTE		New Orlean	s.La.
AIR		Skinner + Sher	man
RUNOFF	-	(waltham,	mass!
SPILL		SAS for radi	cotion +
SOIL	23	National Air	+ Radiation-
VEGETATION		montgonery,	Al
OTHER		U /	
III. FIELD MEASUREMENTS TA			
01 TYPE	02 COMMENTS	a 11 11 · · · 1	· .
William	PIT	con an chinty	Temp
Sample	10.11-	-) 0 0 - 0 - 0	(-) / (2/2
	pm -	rene hentral	(7.0) (Haus
	01	buffering for	m PUy
	Cond	notivity - high	
IV. PHOTOGRAPHS AND MAPS			7/10-
01 TYPE TOROUND SAERIAL		2 IN CUSTODY OF Name of organization or individual	P#
C3 MAPS S4 LOCATION YES NO	OF MAPS	· · · · · · · · · · · · · · · · · · ·	
V. OTHER FIELD DATA COLLEC	CTED (Provide narrative descr	D(On)	
K	Jarl		
		•	
VI. SOURCES OF INFORMATIO	N .Cite specific references, e.g.	state (res., sample unavisio). I coms	
			
Fiel	d bo	ok	

		POTENTIAL HAZARDOUS WASTE SITE			I. IDENTIFICATION		
\$EPA				TION REPORT	OI STATE O	<i>U</i> U	43075151
			PART 7 - OWNE	RINFORMATION			10-33 (-1
II. CURRENT OWNER(S)		,		PARENT COMPANY III ADDICADIO			
OI NAME OJ STREET ADDRESS 1 0 301 350 A10	wit	02 0	+8 NUMBER	OB NAME		090	+B NUMBER
RU. BOX 1329			04 SIC CODE	IC STREET ADDRESS IP O BOX. RFD . etc :	_		11 SIC CODE
Palmetto	CO STATE	07 Z	34220	12 CITY	13 STATE	14 Z	P CODE
O1 NAME	<u> </u>	02 D	+ B NUMBER	08 NAME		09 D	+8 NUMBER
03 STREET ADDRESS IP O Box. RFD 4. 010 ;		•	04 SIC CODE	10 STREET ADDRESS IP O BOA, RED P. OIC I			11 SIC CODE
05 CITY	06 STATE	07 Z	IP CODE	12 CITY	13 STATE	14 Z	P CODE
01 NAME		02 0	+8 NUMBER	OB NAME		09 0	+8 NUMBER
03 STREET ADDRESS (P O Box, RFD + etc ;			04 SIC CODE	10 STREET ADDRESS (P O. Box. RFD # atc.)			1 1 SIC CODE
05 CITY	06 STATE	07 Z	P CODE	12 CITY	13 STATE	1 4 ZI	PCODE
01 NAME		02 D	+ B NUMBER	08 NAME		090	+ B NUMBER
03 STREET ADDRESS (P.O. Box. RFO #. etc.)			04 SIC CODE	10 STREET ADDRESS (P.O. Box. RFD #, etc.)			11 SIC COOE
05 CITY	06 STATE	07 Z	IP CODE	12 CITY	13 STATE	142	IP CODE
III. PREVIOUS OWNER(S) (List most recent first)	<u> </u>		·	IV. REALTY OWNER(S) (If applicable: list mos	t recent first)	<u> </u>	
01 NAME		02 D	+ B NUMBER	01 NAME		02 D	+8 NUMBER
O3 STREET ADDRESS: P O Box. RFD * etc.)			04 SIC CODE	03 STREET ADDRESS (P.O. Box. RFD #, etc.)		94 SIC CODE	
05 CITY	OBSTATE	07 ZI	P CODE	05 CITY	06 STATE	07 Z	P CODE
01 NAME		02 D-	B NUMBER	01 NAME		02 0	+B NUMBER
03 STREET ADDRESS P.O. dox. RFD # etc.)		•	04 SIC CODE	03 STREET ADDRESS (P. O. Box. RFD #, etc.)			04 SIC CODE
05 CITY	08 STATE	07 ZII	PCODE	05 CITY	06 STATE	07 Z	P CODE
01 NAME		02 D	+ B NUMBER	O1 NAME		02 D	+8 NUMBER
03 STREET ADDRESS 9 2 301 AFD 9 41C.1			04 SIC CCDE	03 STREET ADDRESS (P O. Box. RFD #, etc.)			04 SIC CODE
OSCITY	06STATE	07 2	ZIP CODE	OS CITY	06 STATE	07 ZI	PCODE
V. SOURCES OF INFORMATION (Cite specific	c references.	0.g 5ti	ste files, sample analysis, re		1		
•					······································		
Interven	リ	7	7 les.				

		PC	POTENTIAL HAZARDOUS WASTE SITE			I. IDENTIFICATION		
\$EPA			SITE INSPE	ECTION REPORT ATOR INFORMATION	OT STATE 102 SITE NUMBER DOUGLOS			
II. CURRENT OPERATO	OR Provide it different from	m owner!		OPERATOR'S PARENT COMPAN	Y((200m/2008)			
01 NAME			Ø2 D+B NUMBER	10 NAME		11 D+8 NUMBER		
03 STREET ADDRESS - 0 3:	" 2°° C" CM	7	04 SIC CODE	12 STREET ADDRESS (P.O. Box. RFD #, etc.,		13 SIC CODE		
05 CITY	-	06 STATE	07 ZIP CODE	14 CITY	15 STATE	16 ZIP CODE		
08 YEARS OF OPERATION	09 NAME OF OWNER							
III. PREVIOUS OPERAT	OR(S) (List most recent fi	rst: provide oni	ty il different from owneri	PREVIOUS OPERATORS' PARENT	COMPANIES at.	aconca o :e:		
01 NAME			02 D+8 NUMBER	10 NAME		11 D+8 NUMBER		
03 STREET ADDRESS IP 0 84	ox. RFD €, etc.)		04 SIC CODE	12 STREET ADDRESS (P.O. Box, RFD #, etc.)		13 SIC CODE		
05 CITY		06 STATE	07 ZIP CODE	14 CITY	15 STATE	16 ZIP CODE		
08 YEARS OF OPERATION	09 NAME OF OWNER	DURING THIS	S PERIOD		<u></u>			
01 NAME			02 D+B NUMBER	10 NAME		11 0+8 NUMBER		
03 STREET ADDRESS (P.O Bo	x, RFO e etc.)		04 SIC CODE	12 STREET ADDRESS (P.O. Box. RFD #, etc.)	_	13 SIC CODE		
05 CITY		06 STATE	O7 ZIP CODE	14 GITY	15 STATE	16 ZIP CODE		
08 YEARS OF OPERATION	09 NAME OF OWNER	DURING THIS	S PERIOD					
01 NAME	<u> </u>		02 D+B NUMBER	10 NAME	·	11 D+8 NUMBER		
03 STREET ADDRESS (P O. 80)	s. RFO # etc.)		04 SIC CODE	12 STREET ADDRESS (P.O. Box. RFD #. etc.)		13 SIC CODE		
05 CITY		06 STATE	07 ZIP CODE	14 CITY	15 STATE	16 ZIP CODE		
08 YEARS OF OPERATION	09 NAME OF OWNER	DURING THIS	S PERIOD					
IV. SOURCES OF INFO	RMATION (Cite specific	s references, e	.g., state files, sample entrys	us, reportsi				
								

0.504	POTENTIAL HAZARDOUS WASTE SITE			I. IDENTIFICATION Q1.STATE 02 SITE NUMBER		
\$EPA	DART		ECTION REPORT	TL D	043055151	
	PAHI	9 - GENERATOR/	FRANSPORTER INFORMATION			
II. ON-SITE GENERATOR		02 D+B NUMBER	7	·		
, C, ,,,,,,,,						
03 STREET ADDRESS P.C. Box 350 + are		04 SIC CODE				
05 CITY	06 STATE	07 ZIP CODE	$\forall l \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $			
			V/4/\			
III. OFF-SITE GENERATOR(S)	·					
OT NAME		02 D+B NUMBER	OI NAME 1		02 D+8 NUMBER	
O3 STREET ADDRESS (P O Box. RFD + arc.)		04 SIC CODE	03 STREET ADDRESS P.O. Box. RFD #, etc.;		04 SIC CODE	
	loe exam	10770000	05 0170	IOR STATE	07.710.0005	
05 CITY	OG STATE	07 ZIP CODE	05 CITY	OO STATE	07 ZIP CODE	
01 NAME		02 D+B NUMBER	01 NAME		02 D+8 NUMBER	
03 STREET ADDRESS (P.O. Box. RFD # etc.)		04 SIC CODE	03 STREET ADDRESS (P.O. BOX. RFD . etc.)		04 SIC CODE	
OS CITY	06 STATE	07 ZIP CODE	05 CITY	OB STATE	07 ZIP CODE	
				1		
IV. TRANSPORTER(S)						
O1 NAME		02 D+B NUMBER	01 NAME		02 D+B NUMBER	
		104 819 8095			Total ages	
O3 STREET ADDRESS (P.O. Box, RFD =, etc.)		04 SIC CODE	03 STREET ADDRESS (P O. Box, RFD #, etc.)		04 SIC CODE	
05 CITY	IOS STATE	07 ZIP CODE	05 CITY	IOR STATE	07 ZIP CODE	
03 6.1.		0, 2 0002	05011	000	J. 21. 0002	
O1 NAME		02 D+B NUMBER	01 NAME		02 D+B NUMBER	
03 STREET ADDRESS -P O. Box RED 4. etc.1		04 SIC CODE	03 STREET ADDRESS (P. O. BOX. RFD #. etc.)		04 SIC CODE	
05 CITY	06 STATE	07 ZIP CODE	05 CITY	06 STATE	07 ZIP CODE	
V. SOURCES OF INFORMATION (Cite &	pecific references.	e.g., state tiles, sample analysi	s, redorts:			

≎EPA	POTENTIAL HAZARDOUS WASTE SITE SITE INSPECTION REPORT PART 10 - PAST RESPONSE ACTIVITIES		1. IDENTIFICATION 01. STATE 02 SITE NUMBER FL DUY305515
II. PAST RESPONSE ACTIVITIES			
01 T. A. WATER SUPPLY CLOSED 04 DESCRIPTION	responso	03 AGENCY	Rivites
01 T B. TEMPORARY WATER SUPPLY PRO 04 DESCRIPTION		03 AGENCY	(10), 9
01 _C PERMANENT WATER SUPPLY PRO- 04 DESCRIPTION	VIDED 02 DATE	03 AGENCY	
01 _ D. SPILLED MATERIAL REMOVED 04 DESCRIPTION	02 DATE	03 AGENCY	
01 TE. CONTAMINATED SOIL REMOVED 04 DESCRIPTION	02 DATE		
01 _ F. WASTE REPACKAGED 04 DESCRIPTION	02 DATE		
01 I G. WASTE DISPOSED ELSEWHERE 04 DESCRIPTION	02 DATE		
01 TH. ON SITE BURIAL 04 DESCRIPTION	02 DATE		
01 T. I. IN SITU CHEMICAL TREATMENT 04 DESCRIPTION	02 DATE	03 AGENCY	
01 T. J. IN SITU BIOLOGICAL TREATMENT 04 DESCRIPTION	02 DATE	03 AGENCY	
01 T.K. IN SITU PHYSICAL TREATMENT 04 DESCRIPTION	O2 DATE	03 AGENCY	
01 □ L ENCAPSULATION 04 DESCRIPTION	02 DATE	03 AGENCY	
01 TM EMERGENCY WASTE TREATMENT 04 DESCRIPTION	02 DATE	03 AGENCY	
O1 (II N. CUTOFF WALLS 04 DESCRIPTION	J2 CATE	03 AGENCY	
01 II OLEMERGENCY DIKING SURFACE WAT 04 DESCRIPTION	TER DIVERSION 02 DATE	03 AGENCY	
01 T P CUTOFF TRENCHES/SUMP 04 DESCRIPTION	G2 DATE	03 AGENCY	
01 T Q. SUBSURFACE CUTOFF WALL 04 DESCRIPTION	02 DATE	03 AGENCY	

\$EPA

POTENTIAL HAZARDOUS WASTE SITE SITE INSPECTION REPORT PART 10 - PAST RESPONSE ACTIVITIES

OI STATE OZ SITE NUMBER

	PART 10-PAST RESPUNSE ACTIVITIES	<u>'</u>
AST RESPONSE ACTIVITIES : Continued)		
01 _ R BARRIER WALLS CONSTRUCTED 04 DESCRIPTION	02 DATE	03 AGENCY
01 I S. CAPPING/COVERING 04 DESCRIPTION	02 DATE	03 AGENCY
01 Z T. BULK TANKAGE REPAIRED 04 DESCRIPTION	02 DATE	03 AGENCY
01 T U GROUT CURTAIN CONSTRUCTED 04 DESCRIPTION	02 DATE	03 AGENCY
01 TV BOTTOM SEALED 04 DESCRIPTION	02 DATE	03 AGENCY
01 T W GAS CONTROL 04 DESCRIPTION	02 DATE	03 AGENCY
01 Z X. FIRE CONTROL 04 DESCRIPTION	02 DATE	03 AGENCY
01 TY. LEACHATE TREATMENT 04 DESCRIPTION	02 DATE	03 AGENCY
01 Z. AREA EVACUATED 04 DESCRIPTION	02 DATE	03 AGENCY
01 = 1 ACCESS TO SITE RESTRICTED 04 DESCRIPTION	02 DATE	03 AGENCY
01 = 2. POPULATION RELOCATED 04 DESCRIPTION	02 DATE	03 AGENCY
01 Z 3 OTHER REMEDIAL ACTIVITIES 04 DESCRIPTION	02 DATE	03 AGENCY

III. SOURCES OF INFORMATION: Cité specific references, e.g., state friez. sample analysis: reporta-

I. IDENT	IFICATION
O1 STATE	DOY 3055

\$EPA	POTENTIAL HAZARDOUS WASTE SITE SITE INSPECTION REPORT PART 11 - ENFORCEMENT INFORMATION	01 STATE 02 SITE NUMBER
II. ENFORCEMENT INFORMATION		
C1 PAST REGULATORY ENFORCEMENT ACTION		
02 DESCRIPTION OF FEDERAL STATE LCCAL F	RESULATORY ENFORCEMENT ACTION	
		•
•		•
	•	
,		
·		
III. SOURCES OF INFORMATION (Cité spe	ecific references, e.g., state files, sample analysis reports)	

APPENDIX

I. FEEDSTOCKS

CAS Number	Chemical Name	CAS Number	Chemical Name	CAS Number	Chemical Name
1. 7664-41-7	Ammonia	14. 1317-38-0	Cupric Oxide	27. 7778-50-9	Potassium Dichromate
2, 7440-36-0	Antimony	15. 7758-98-7	Cupric Sulfate	28. 1310-58-3	Potassium Hydroxide
3. 1309-64-4	Antimony Trioxide	16. 1317-39-1	Cuprous Oxide	29. 115-07-1	Propylene
4. 7440-38-2	Arsenic	17. 74-85-1	Ethylene	30. 10588-01-9	Sodium Dichromate
5. 1327-53-3	Arsenic Trioxide	18. 7647-01-0	Hydrochloric Acid	31. 1310-73-2	Sodium Hydroxide
6. 21109-95-5	Barium Sulfide	19. 7664-39-3	Hydrogen Fluoride	32. 7646-78-8	Stannic Chloride
7. 7726-95-6	Bromine	20. 1335-25-7	Lead Oxide	33. 7772-99-8	Stannous Chloride
8. 106-99-0	Butadiene	21. 7439-97-6	Mercury	34. 7664-93-9	Sulfuric Acid
9. 7440-43-9	Cadmium	22. 74-82-8	Methane	35. 108-88-3	Toluene
10, 7782-50-5	Chlorine	23. 91-20-3	Napthalene	36. 1330-20-7	Xylene
11, 12737-27-8	Chromite	24, 7440-02-0	Nickel	37. 7646-85-7	Zinc Chloride
12.7440-47-3	Chromium	25, 7697-37-2	Nitric Acid	38. 7733-02-0	Zinc Sulfate
13. 7440-48-4	Cobalt	26, 7723-14-0	Phosphorus	1	

II. HAZARDOUS SUBSTANCES

CAS Number	Chemical Name	CAS Number	Chemical Name	CAS Number	Chemical Name
1. 75-07-0	Acetaldehyde	47. 1303-33-9	Arsenic Trisulfide	92. 142-71-2	Cupric Acetate
2.64-19-7	Acetic Acid	48. 542-62-1	Barium Cyanide	93. 12002-03-8	Cupric Acetoarsenite
3. 108-24-7	Acetic Anhydride	49, 71-43-2	Benzene	94. 7447-39-4	Cupric Chloride
4. 75-86-5	Acetone Cyanohydrin	50, 65-85-0	Benzoic Acid	95. 3251-23-8	Cupric Nitrate
5. 506-96-7	Acetyl Bromide	51. 100-47-0	Benzonitrile	96. 5893-66-3	Cupric Oxalate
6. 75-36-5	Acetyl Chloride	52. 98 - 88-4	Benzoyi Chloride	97. 7758-98 <i>-</i> 7	Cupric Sulfate
7. 107-02-8	Acrolein	53. 100-44-7	Benzyl Chloride	98. 10380-29-7	Cupric Sulfate Ammoniated
8. 107-13-1	Acrylonitrile	54. 7440-41-7	Beryllium	99. 815-82-7	Cupric Tartrate
9. 124-04-9	Adipic Acid	55. 7 7 87 -4 7-5	Beryllium Chloride	100. 506-77-4	Cyanogen Chloride
10. 309-00-2	Aldrin	56. 7787 - 49-7	Beryllium Fluoride	101.110-82-7	Cyclohexane
11. 10043-01-3	Aluminum Sulfate	57. 1 3597-99-4	Beryllium Nitrate	102. 94-75-7	2,4-D Acid
12. 107-18-6	Allyl Alcohol	58. 123 - 86-4	Butyl Acetate	103. 94-11-1	2,4-D Esters
13. 107-05-1	Allyl Chloride	59, 84-74-2	n-Butyl Phthalate	104.50-29-3	TOOT
14. 7664-41-7	Ammonia	60. 109-73-9	Butylamine	105. 333-41-5	Diazinon
15. 631-61 -8	Ammonium Acetate	61, 107 - 92-6	Butyric Acid	106. 1918-00-9	Dicamba
16. 1863-63-4	Ammonium Benzoate	62. 543-90-8	Cadimium Acetate	107. 1194-65-6	Dichlobenil
17. 1066-33-7	Ammonium Bicarbonate	63. 7789 -42-6	Cadmium Bromide	108. 117-80-6	Dichlone
18. 7789-09-5	Ammonium Bichromate	64. 10108-64-2	Cadmium Chloride	109. 25321-22-6	Dichlorobenzene (all isomers)
19. 13 41-49- 7	Ammonium Bifluoride	65. 7778- 44- 1	Calcium Arsenate	110. 266-38-19-7	Dichloropropane (all isomers)
20. 101 92-30-0	Ammonium Bisulfite	66, 52740-16-6	Calcium Arsenite	111.26952-23-8	Dichloropropene (all isomers)
21. 1111-78-0	Ammonium Carbamate	67. 75-20-7	Calcium Carbide	112.8003-19-8	Dichtoropropene-
22. 12125-02-9	Ammonium Chloride	68, 13765-19-0	Calcium Chromate		Dichloropropane Mixture
23. 7 788-98-9	Ammonium Chromate	69. 592-01-8	Calcium Cyanide	113. 75-99-0	2-2-Dichloropropionic Acid
24. 3012-65-5	Ammonium Citrate, Dibasic	70. 26264-06·2	Calcium Dodecylbenzene	114.62-73-7	Dichlorvos
25. 1 3826-83-0	Ammonium Fluoborate		Sulfonate	115. 60-57-1	Dieldrin
26. 12125-01-8	Ammonium Fluoride	71, 7778-54-3	Calcium Hypochlorite	116. 109-89-7	Diethylamine
27. 13 36-21-6	Ammonium Hydroxide	72. 133-06-2	Captan	117, 124-40-3	Dimethylamine
28. 6009-70-7	Ammonium Oxalate	73. 63-25-2	Carbaryi	118. 25154-54-5	Dinitrobenzene (all isomers)
29, 16919-19-0	Ammonium Silicofluoride	74, 1563-66-2	Carbofuran	119.51-28-5	Dinitrophenol .
30. 7773 -06-0	Ammonium Sulfamate	75. 75-15-0	Carbon Disulfide	120. 25321-14-6	Dinitrotoluene (aii isomers)
31, 12135-76-1	Ammonium Sulfide	76. 56 -23-5	Carbon Tetrachloride	121.85-00-7	Diquat
32. 10196-04-0	Ammonium Sulfite	77. 57-74-9	Chlordane	122. 298-04- 4	Disulfoton
33. 14307-43-8	Ammonium Tartrate	78. 7782-50-5	Chlorine	123. 330-54-1	Diuron
34. 1762-95-4	Ammonium Thiocyanate	79. 108-90-7	Chlorobenzene	124. 27176-87-0	Dodecy/benzenesulfonic Acid
35. 7783-18-8	Ammonium Thiosulfate	80. 67 - 66-3	Chioroform	125, 115-29-7	Endosulfan (all isomers)
36. 628-63- 7	Amyl Acetate	81. 7790- 94 -5	Chlorosulfonic Acid	126 <i>.</i> 72-20-8	Endrin and Metabolites
37. 62-53-3	Aniline	82. 2921-88-2	Chlorpyrifos	127, 106-89-8	Epichlorohydrin
38. 7647-18-9	Antimony Pentachloride	83. 1066-30-4	Chromic Acetate	128.563-12-2	Ethion
39. 7789-61-9	Antimony Tribromide	84. 7738 .94-5	Chromic Acid	129, 100-41-4	Ethyl Benzene
40. 10025-91-9	Antimony Trichloride	85. 10101-53-8	Chromic Sulfate	130, 107-15-3	Ethylenediamine
41. 7783-56-4	Antimony Trifluoride	86.10049-05-5	Chromous Chloride	131, 106-93-4	Ethylene Dibromide
42. 1309-64-4	Antimony Trioxide	87, 544-18-3	Cobaltous Formate	132, 107-06-2	Ethylene Dichloride
43. 1303-32-8	Arsenic Disulfide	88, 14017-41-5	Cobaltous Sulfamate	133, 60-00-4	EDTA
44, 1303-28-2	Arsenic Pentoxide	89. 56-72-4	Coumaphos	134, 1185-57-5	Ferric Ammonium Citrate
45, 7784-34-1	Arsenic Trichloride	90. 1319-77-3	Cresol	135, 2944-67-4	Ferric Ammonium Oxalate
46. 1327-53-3	Arsenic Trioxide	91.4170-30-3	Crotonaidehyde	136, 7705-08-0	Ferric Chloride

II. HAZARDOUS SUBSTANCES

CAS Number	Chemical Name	CAS Number	Chemical Name	CAS Number	Chemical Name
137, 7783-50-8	Ferric Fluoride	192, 74-89-5	Monomethylamine	249. 7632-00-0	Sodium Nitrate
138. 10421-48-4	Ferric Nitrate	193. 300-76-5	Naled	250. 7558-79-4	Sodium Phosphate, Dibasic
139, 10028-22-5	Ferric Sulfate	194. 91-20-3	Naphthalene	251. 7601-54-9	Sodium Phosphate, Tribasic
140. 10045-89-3	Ferrous Ammonium Sulfate	195, 1338-24-5	Naphthenic Acid	252. 10102-18-8	Sodium Selenite
141, 7758-94-3	Ferrous Chloride	196, 7440-02-0	Nickel	253. 7789-06-2	Strontium Chromate
142. 7720-78-7	Farrous Sulfate	197, 15699-18-0	Nickel Ammonium Sulfate	254, 57-24-9	Strychnine and Salts
143. 206-44-0	Fluoranthene	198. 37211-05-5	Nickel Chloride	255, 100-420-5	Styrene
144. 50-00-0	Formaidehyde	199, 12054-48-7	Nickel Hydroxide	256. 12771-08-3	Sulfur Monochloride
145.64-18-6	Formic Acid	200. 14216-75-2	Nickel Nitrate	257. 7664-93-9	Sulfuric Acid
146, 110-17-8	Fumaric Acid ,	201. 7786-81-4	Nickel Sulfate	258. 93-76-5	2,4,5-T Acid
147. 98-01-1	Furfural	202. 7697-37-2	Nitric Acid	259, 2008-46-0	2,4,5-T Amines
148.86-50-0	Guthion	203. 98-95-3	Nitrobenzene	260. 93 -79-8	2,4,5-T Esters
149. 76-44-8	Heptachlor	204. 10102-44-0	Nitrogen Dioxide	261. 13560-99-1	2,4,5-T Salts
150. 118-74-1	Hexachlorobenzene	205. 25154-55 -6	Nitrophenol (all isomers)	262. 93-72-1	2,4,5-TP Acid
151.87-68-3	Hexachlorobutadiene	206. 1321-12-6	Nitrotoluene	263. 32534-95-5	2,4,5-TP Acid Esters
152. 67-72-1	Hexachloroethane	207. 30525-89-4	Paraformaldehyde	264. 72-54-8	TDE
153. 70-30 -4	Hexachlorophene	208. 56-38-2	Parathion	265. 9 5-94-3	Tetrachlorobenzene
154.77-47-4	Hexachlorocyclopentadiene	209.608-93-5	Pentachlorobenzene	266. 127-18-4	Tetrachloroethane
155. 7647-01-0	Hydrochloric Acid	210. 87-86-5	Pentachlorophenol	267. 78-00-2	Tetraethyl Lead
	(Hydrogen Chloride)	211. 85-01-8	Phenanthrene	268. 107-49-3	Tetraethyl Pyrophosphate
156. 76 64-39-3	Hydrofluoric Acid	212. 108-95-2	Phenol	269. 7446-18-6	Thallium (I) Sulfate
	(Hydrogen Flüoride)	213. 75-44-5	Phosgene	270. 108 -88- 3	Toluene
157. 74-90-8	Hydrogen Cyanide	214. 7664-38-2	Phosphoric Acid	271.8001-35-2	Toxaphene
158. 7783-06-4	Hydrogen Sulfide	215. 7723-14-0	Phosphorus	272, 12002-48-1	Trichlorobenzene (all isomers)
159, 78-79-5	Isoprene	216. 10025-87-3	Phosphorus Oxychloride	273. 52 -68-6	Trichlorfon
160. 42504-46- 1	Isopropanolamine	217, 1314-80-3	Phosphorus Pentasulfide	274. 25323-89-1	Trichloroethane (all isomers)
	Dodecyibenzenesulfonate	218, 7719-12-2	Phosphorus Trichloride	275. 79-01-6	Trichloroethylene
161. 115-32-2	Kelthane	219. 7784-41-0	Potassium Arsenate	276. 25167-82-2	Trichlorophenol (all isomers)
162. 143-50-0	Kepone	220. 10124-50-2	Potassium Arsenite	277. 27323-41-7	Triethanolamine
163.301-04-2	Lead Acetate Lead Arsenate	221, 7778-50-9	Potassium Bichromate	270 121 44 0	Dodecylbenzenesulfonate Triothylomina
164. 3687-31-8 165. 7758-95-4	Lead Chloride	222, 7789-00-6	Potassium Chromate	278, 121-44-8 279, 75-50-3	Triethylamine Trimethylamine
166. 13814-96-5	Lead Fluoborate	223. 7722-64-7 224. 2312-35-8	Potassium Permanganate Propargite	280. 541-09-3	Uranyl Acetate
167, 7783-46-2	Lead Fluoride	225. 79-09-4	Propionic Acid	281. 10102-06-4	Uranyl Nitrate
168. 10101-63-0	Lead Iodide	226, 123-62-6	Propionic Anhydride	282, 1314-62-1	Vanadium Pentoxide
169. 18256-98-9	Lead Nitrate	227. 1336-36-3	Polychlorinated Biphenyls	283, 27774-13-6	Vanadyi Sulfate
170. 7428-48-0	Lead Stearate	228, 151-50-8	Potassium Cyanide	284. 108-05-4	Vinyl Acetate
171, 15739-80-7	Lead Sulfate	229, 1310-58-3	Potassium Hydroxide	285. 75-35-4	Vinylidene Chloride
172, 1314-87-0	Lead Suifide	230, 75-56-9	Propylene Oxide	286. 1300-71-6	Xylenol
173. 592-87-0	Lead Thiocyanate	231, 121-29-9	Pyrethrins	287.557-34-6	Zinc Acetate
174. 58-89-9	Lindane	232. 91-22-5	Quinoline	288. 52628-25-8	Zinc Ammonium Chloride
175. 14307-35-8	Lithium Chromate	233. 108-46-3	Resorcinol	289. 1332-07-6	Zinc Borate
176. 121-75-5	Malthion	234, 7446-08-4	Selenium Oxide	290. 7699-45-8	Zinc Bromide
177. 110-16-7	Maleic Acid	235. 7761-88-8	Silver Nitrate	291.3486-35-9	Zinc Carbonate
178. 108-31-6	Maleic Anhydride	236, 7631-89-2	Sodium Arsenate	292. 7646-85-7	Zinc Chloride
179. 2032-65-7	Mercaptodimethur	237. 7784 - 46-5	Sodium Arsenite	293.557-21-1	Zinc Cyanide
180, 592-04-1	Mercuric Cyanide	238. 10588-01-9	Sodium Bichromate	294. 7783-49-3	Zinc Fluoride
181, 10045-94-0	Mercuric Nitrate	239, 1333-83-1	Sodium Bifluoride	295.557-41-5	Zinc Formate
182. 7783-35-9	Mercuric Sulfate	240, 7631-90-5	Sodium Bisulfite	296,7779-86-4	Zinc Hydrosulfite
183. 592-85-8	Mercuric Thiocyanate	241. 7775-11-3	Sodium Chromate	297, 7779-88-6	Zinc Nitrate Zinc Phenoisulfonate
184. 10415-75-5	Mercurous Nitrate	242. 143-33-9	Sodium Cyanide	298. 127-82-2	
185, 72-43-5	Methoxychlor	243. 25155-30-0	Sodium Dodecylbenzene	299, 1314-84-7 300, 16871-71-9	Zinc Phosphide Zinc Silicofluoride
186. 74-93-1	Methyl Mercaptan		Suifonate	300. 16871-71-9 301. 7733-02-0	Zinc Sulfate
187. 80-62-6	Methyl Methacrylate	244. 7681-49-4	Sodium Fluoride	302, 13746-89-9	Zirconium Nitrate
188. 298-00-0	Methyl Parathion	245. 16721-80-5	Sodium Hydrosulfide	303, 16923-95-8	Zirconium Potassium Fluoride
189. 7786-34-7	Mevinphos	246. 1310-73-2	Sodium Hydroxide	304. 14644-61-2	Zirconium Sulfate
190. 315-18-4	Mexacarbate	247, 7681-52-9	Sodium Hypochlorite	305. 10026-11-6	
191. 75-04-7	Monoethylamine	248. 124-41-4	Sodium Methylate	200. 10000 170	

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GYPSUM STACK STATUS
SOUTHWEST DISTRICT
NOVEMBER 1988

DISCUSSION

As a result of the extraction of phosphate from ore, gypsum (hydrated calcium sulfate) is produced as a byproduct. The gypsum is pumped as a slurry with plant process water to the tops of gypsum stacks for disposal. The plant process water is typically characterized as having a very low pH and high concentrations of arsenic, cadmium, chromium, lead, sodium, fluoride, manganese, iron, sulfate and total dissolved solids (TDS). High levels of radioactive particle emissions are also typical for the plant process water.

Unless the gypsum stack and associated process water cooling pond are underlain by an impervious liner, contaminants are discharged to groundwater. Soils underlying the gypsum stack/cooling pond complexes will have a variable capacity to neutralize the low pH causing a number of the contaminants to precipitate from solution and attenuating the propogation of such contaminants in groundwater.

Of the 15 gypsum stack/cooling pond complexes in the Southwest District, ll continue phosphate fertilizer production and associated gypsum disposal activities. Four of the ll active facilities have recently submitted applications to expand their gypsum disposal operations.

With the exception of Gardinier, all gypsum stack facilities were issued permits for groundwater monitoring in September, 1985. The permittees collectively objected to language in their permits which restricted their zones of discharge to the surficial aquifer, and the permits were therefore withdrawn. All permits for groundwater monitoring were reissued in early 1986 except those for C.F. Industries, Central Phosphates, Conserv and Agrico Chemical Company. These facilities had groundwater contamination problems which they wished to resolve prior to applying for a second groundwater monitoring permit. Agrico Chemical Company was issued a permit for groundwater monitoring early in 1987 which provided for an extended zone of discharge. Twelve of the 15 facilities therefore have permits for groundwater monitoring.

All gypsum stack/cooling pond complexes routinely monitor proximal groundwater quality pursuant to approved groundwater monitoring plans. All 15 facilities are "Existing Installations" and are therefore not required to meet secondary drinking water standards at their property boundaries or within the Intermediate or Floridan aquifers unless surface waters or potable wells may be affected.

FACILITY OVERVIEW

C.F. Industries

The facility includes sulfuric acid plants, phosphoric acid plants, diammonium phosphate plants and a gypsum stack/cooling pond complex on approximately 1000 acres near Bartow in Polk County. Operations began at the facility in 1962 and gypsum disposal ceased for a time between 1986 and 1988. Gypsum disposal activities continue at about 25% of plant capacity.

A groundwater monitoring plan was submitted to the Department in September, 1983 and was approved in January, 1984. A permit for groundwater monitoring was issued to C.F. Industries on September 11, 1985 and was subsequently withdrawn on October 23, 1985. A groundwater monitoring permit has never been reissued for this facility. As a result of groundwater violations, C.F. Industries filed a petition for an extended zone of discharge on December 31, 1986.

Groundwater quality problems have been reported in the surficial aquifer at the site as follows:

Primary Drinking Water Standards

<u>Concentration</u>	<u>Standard</u>
1.8 mg/L	.05 mg/L
.51 mg/L	.01 mg/L
2.8 mg/L	.05 mg/L
2100 mg/L	160 mg/L
5480 pCi/L	15 pCi/L
8.9 pCi/L	5 pCi/L
4690 mg/L	2 mg/L
	1.8 mg/L .51 mg/L 2.8 mg/L 2100 mg/L 5480 pCi/L 8.9 pCi/L

Secondary Drinking Water Standards

<u>Contaminant</u>	<u>Concentration</u>	<u>Standard</u>
рH	1.5 SU	>6.5 SU
sulfate	4570 mg/L	250 mg/L

A Warning Notice was issued to C.F. Industries during July, 1985 for groundwater quality violations. The issues raised in the Warning Notice were to be resolved by an extended zone of discharge onto adjacent property, however a determination as to the extended zone of discharge is pending the collection of additional data.

Central Phosphates

The facility includes sulfuric acid plants, phosphoric acid plants, granulated triple superphosphate plants and a gypsum stack/cooling pond complex on approximately 1000 acres near Plant City in Hillsborough County. Operations began at the facility in 1965 and empanded in 1975.

A groundwater monitoring plan was submitted to the Department in September, 1983 and was approved in February, 1984. A permit for groundwater monitoring was issued to Central Phosphates on September 9, 1985 and was subsequently withdrawn on October 23, 1985. A groundwater monitoring permit has never been reissued for this facility. An application for an expanded gypsum stack/cooling pond complex was submitted by Central Phosphates on January 19, 1988 and withdrawn on November 4, 1988.

Groundwater quality problems have been reported in the surficial aquifer at the site as follows:

Primary Drinking Water Standards

Contaminant	<u>Concentration</u>	<u>Standard</u>
Cadmium	.022 mg/L	.01 mg/L
chromium	.052 mg/L	.05 mg/L
lead	.09 mg/L	.05 mg/L
sodium	1250 mg/L	160 mg/L
gross alpha	29 pCi/L	15 pCi/L

Secondary Drinking Water Standards

Contaminant	<u>Concentration</u>	<u>Standard</u>
manganese	12 mg/L	.05 mg/L
sulfate	5500 mg/L	250 mg/L
iron	260 mg/L	.3 mg/L
TDS	10,000 mg/L	500 mg/L

A Warning Notice was issued to Central Phosphates during July, 1985 for groundwater quality violations and a Consent Order was executed in September, 1987. Groundwater problems are now known to occur within the Floridan aquifer beyond the facility property boundary as follows:

Primary Drinking Water Standards

<u>Contaminant</u>	<u>Concentration</u>	<u>Standard</u>	
sodium	415 mg/L	160 mg/L	
gross alpha	29.4 pCi/L	15 pCi/L	

Secondary Drinking Water Standards

<u>Contaminant</u>	<u>Concentration</u>	<u>Standard</u>
sulfate	2230 mg/L	250 mg/L
iron	30 mg/L	.3 mg/L
TDS	3700 mg/L	500 mg/L
рH	6.37 SU	>6.5 SU

Conserv

The facility includes a sulfuric acid plant, a phosphoric acid plant a diammonium phosphate plant and a gypsum stack/cooling pond complex on approximately 800 acres near Nichols in Polk County. Operations began at the facility in 1953 and expanded in 1962.

A groundwater monitoring plan was submitted to the Department in September, 1983 and was approved in February, 1984. A permit for groundwater monitoring was issued to Conserv on September 9, 1985 and was subsequently withdrawn on October 23, 1985. A groundwater monitoring permit has never been reissued for this facility. An application for an expanded gypsum stack/cooling pond complex was submitted by Conserv on February 16, 1988. It is anticipated that the application for an expansion permit will be withdrawn by Conserv.

Groundwater quality problems have been reported in the surficial aguifer at the site as follows:

Primary Drinking Water Standards

<u>Contaminant</u>	<u>Concentration</u>	Standard	
arsenic	.15 mg/L	.05 mg/L	
chromium	.22 mg/L	.05~mg/L	
sodium	630 mg/L	160 mg/L	
gross alpha	, 50 pCi/L	15 pCi/L	

Secondary Drinking Water Standards

Contaminant	Concent	ration	Stand	dard
sulfate	3620	mg/L	250	mg/L
iron	110	mg/L	.3	mg/L
manganese	3.4	mg/L	. 05	mg/L
рH	4.3	SU	>6.5	SU
TDS	8760	mg/L	500	mg/L

A Warning Notice was issued to Conserv in June, 1985 for groundwater quality violations. The issues raised in the Warning Notice are to be resolved by execution of an acceptable Consent Order.

Farmland Industries

The facility includes phosphoric acid plants and a gypsum stack/cooling pond complex on approximately 1000 acres near Bartow in Polk County. Operations began at the facility in 1965 and expanded in 1971.

A groundwater monitoring plan was submitted to the Department in September, 1983 and was approved in February, 1984. A permit for groundwater monitoring was issued to Farmland on September 11, 1985 and was subsequently withdrawn on October 23, 1985. A second permit for groundwater monitoring was issued on January 31, 1986.

Groundwater quality problems have been reported in the surficial aquifer at the site as follows:

Primary Drinking Water Standards

Contaminant	<u>Concentration</u>	<u>Standard</u>	
chromium	.066 mg/L	.05 mg/L	
sodium gross alpha	1064 mg/L 111.9 pCi/L	160 mg/L 15 pCi/L	
diozz gibug	TIT.3 DCI/II	TO DOING	

Secondary Drinking Water Standards

Contaminant	<u>Concentration</u>	Standard
iron	30 mg/L	.3 mg/L
manganese	.38 mg/L	.05 mg/L
TDS	11,000 mg/L	500 mg/L
sulfate	3500 mg/L	250 mg/L

A Warning Notice was issued to Farmland during October, 1987 for groundwater quality violations. A proposed Consent Order is to be issued to Farmland by December, 1988.

Gardinier

The facility includes sulfuric acid plants, phosphoric acid plants, triple superphosphate plants, ammonium phosphate plants and a gypsum stack/cooling pond complex on approximately 2600 acres near Gibsonton in Hillsborough county. Operations began at the facility in 1924 and closure of the existing facility is anticipated by 1990 as construction of a new facility on separate property has recently been permitted.

A groundwater monitoring plan was submitted to the Department in September, 1983 and was approved in January, 1984. A permit for groundwater monitoring was issued to Gardinier on May 19, 1986.

The Department filed a complaint against Gardinier in June, 1988 to address environmental impacts associated with an acid spill which occurred in May, 1988.

Agrico Chemical Company

The facility includes sulfuric acid plants, phosphoric acid plants, a granulated triple superphosphate plant and a gypsum stack/cooling pond complex on approximately 2200 acres near Fort Meade in Polk County. Operations began at the facility in 1955.

A groundwater monitoring plan was submitted to the Department in September, 1983 and was approved in January, 1984. A permit for groundwater monitoring was issued to Agrico on September 10, 1985 and was subsequently withdrawn on October 23, 1985. A second permit for groundwater monitoring was issued on January 30, 1987 which provided for an extended zone of discharge onto adjacent property.

Groundwater quality problems have been reported in the surficial aguifer at the site as follows:

Primary Drinking Water Standards

Contaminant	Concentration	Standard	
arsenic	.26 mg/L	.05 mg/L	
sodium	1146 mg/L	160 mg/L	
gross alpha	152.4 pCi/L	15 pCi/L	
combined radium	34.2 pCi/L	5 pCi/L	

Secondary Drinking Water Standards

Contaminant	<u>Concentration</u>	<u>Standard</u>
sulfate	2900 mg/L	250 mg/L
TDS	7046 mg/L	500 mg/L

A Warning Notice was issued to Agrico during July, 1985 for groundwater quality violations. The issues raised in the Warning Notice were resolved by extending the facility zone of discharge onto adjacent property.

American Cyanamid

The facility included a sulfuric acid plant, a phosphoric acid plant, a triple superphosphate plant and a gypsum stack/cooling pond complex on approximately 300 acres near Fort Meade in Polk County. Operations began at the facility in 1957 and ceased in 1971.

A groundwater monitoring plan was submitted to the Department in September, 1983 and approved in March, 1984. A permit for groundwater monitoring was issued to American Cyanamid on June 5, 1984 and subsequently withdrawn on October 23, 1985. A second permit for groundwater monitoring was issued on April 30, 1986.

Eleven of the 15 gypsum stack/cooling pond complexes are reportedly violating primary drinking water standards within the surficial aquifer at their property boundaries, and/or within the Intermediate or Florida aquifers. Groundwater quality investigations at 6 of these 11 facilities are currently being conducted through various enforcement mechanisms. As mentioned previously, groundwater quality violations at the Agrico Chemical facility have been addressed by modifying their groundwater monitoring permit to provide for an extended zone of discharge onto adjacent property.

All 15 gypsum stack/cooling pond complexes may be expected to leach contaminants to groundwater for a period of 50 years or more following the cessation of gypsum disposal activities. Appropriate site closure may help to minimize the spread of contaminants to proximal groundwater or surface water. Innovative uses of the remaining gypsum such as incorporation into building materials or road bed materials may also be encouraged during site closure.

Solid waste statutes which became effective October 1, 1988 require that all facilities disposing of their own solid waste on their own property after that date address groundwater discharges through an appropriate permit. The extent to which other solid waste rules, such as those requiring impervious liners, site closure and financial assurance, may apply to gypsum stacks is unclear.

Secondary Drinking Water Standards

Contaminant	<u>Concentration</u>	<u>Standard</u>
sulfate	2615 mg/L	250 mg/L
TDS	8144 mg/L	500 mg/L
iron	21.8 mg/L	.3 mg/L
manganes e	.46 mg/L	.05 mg/L
На	6.1 SÚ	>6.5 SÜ

Royster, Piney Point (former) AMAXI

The facility includes sulfuric acid plants, phosphoric acid plants, ammoniated fertilizer plants and a gypsum stack/cooling pond complex on approximately 300 acres in Manatee County. Operations began at the facility in 1966 and expanded in 1978.

A groundwater monitoring plan was submitted to the Department in September, 1983 and was approved sometime thereafter. A permit for groundwater monitoring was issued to AMAX on September 9, 1985 and was subsequently withdrawn on October 23, 1985. A second permit for groundwater monitoring was issued on March 14, 1987, following the collection of additional information.

Groundwater quality problems have been reported in the surficial aquifer at the site as follows:

Primary Drinking Water Standards

<u>Contaminant</u>	Concentration	<u>Standard</u>
sodium	180 mg/L	160 mg/L

Secondary Drinking Water Standards

<u>Contaminant</u>	<u>Concentration</u>	<u>Standard</u>
sulfate	745 mg/L	250 mg/L
TDS	1586 mg/L	500 mg/L
manganese	.31 mg/L	.05 mg/L
iron	2.9 mg/L	.3 mg/L

Whether contaminants reported at Royster, Piney Point may be attributed to proximity to Tampa Bay is unclear.

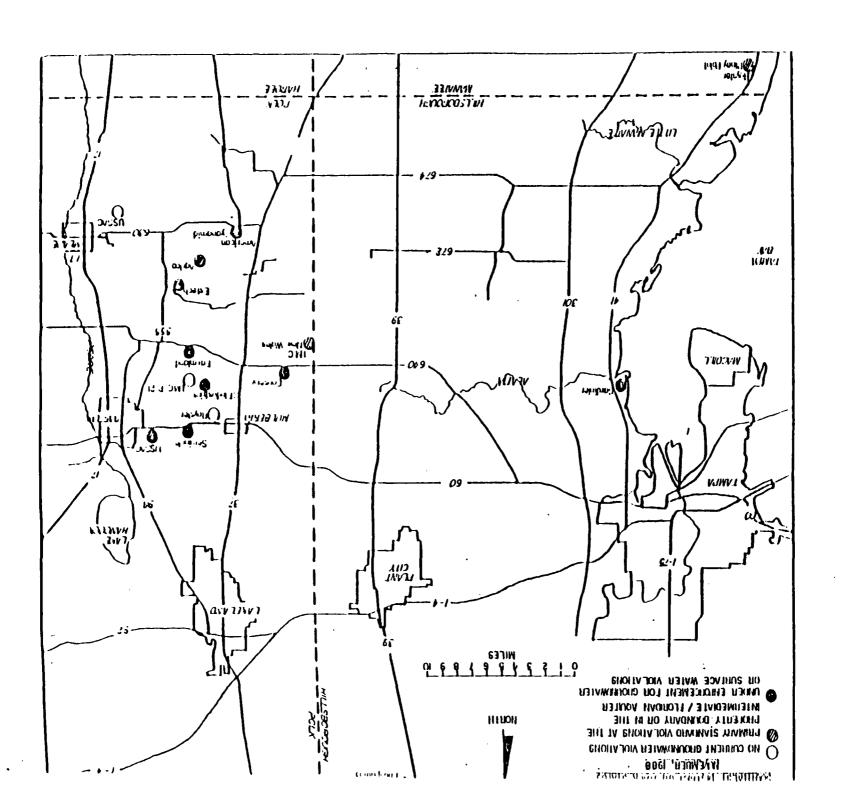
Seminole Fertilizer (formerly W.R. Grace)

The facility includes sulfuric acid plants, granulated triple superphosphate plants, phosphoric acid plants, diammonium phosphate plants and two gypsum stack/cooling pond complexes on approximately 2000 acres near Bartow in Polk County. One gypsum stack/cooling pond complex is located north of SR 60 adjacent to the fertilizer plant, and the other gypsum stack/cooling pond complex is located south of SR 60. Operations at the north gypsum stack began in 1954 and operations at the south gypsum stack began in 1965.

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Roystor, Mulberry	Х					X			۲		

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A groundwater monitoring plan was submitted to the Department in September, 1983 and was approved sometime thereafter. A permit for groundwater monitoring was issued to W.R. Grace on September 10, 1985 and was subsequently withdrawn on October 23, 1985. A second permit for groundwater monitoring was issued to W.R. Grace on April 15, 1986.

Groundwater quality problems have been reported in the surficial aquifer at the site as follows:

Primary Drinking Water Standards

Contaminant	<u>Concentration</u>	<u>Standard</u>
sodium gross alpha	759 mg/L 80 pCi/L	160 mg/L 15 pCi/L
combined radium	14.4 pCi/L	5 pCi/L

Secondary Drinking Water Standards

Contaminant	<u>Concentration</u>	Standard
sulfate	2012 mg/L	250 mg/L
TDS	4284 mg/L	500 mg/L
iron	245 mg/L	.3 mg/L
manganese	.25 mg/L	.05 mg/L

A Warning Notice was issued to W.R. Grace on March 3, 1988 for violations of groundwater quality standards. Subsequently, contaminants were discovered in nearby potable wells as follows:

Primary Drinking Water Standards

Contaminant	<u>Concentration</u>	<u>Standard</u>
arsenic	.075 mg/L	.05 mg/L
lead	.181 mg/L	.05 mg/L
sodium	176.7 mg/L	160 mg/L
gross alpha	59 pCi/L	15 pCi/L
combined radium	18.8 pCi/L	5 pCi/L

Secondary Drinking Water Standards

<u>Contaminant</u>	<u>Concentration</u>	Standard
sulfate	606 mg/L	250 mg/L
TDS	831 mg/L	500 mg/L
iron	29.6 mg/L	.3 mg/L

The potable wells have recently been replaced with city water, and a proposed Consent Order is to be issued to W.R. Grace by December, 1988.

USSAC, Bartow

The facility includes a sulfuric acid plant, a phosphoric acid plant, a diammonium phosphate plant and a gypsum stack/cooling pond complex on approximately 1000 acres near Bartow in Polk county. Operations began at the facility in 1946 and ceased in 1981.

A groundwater monitoring plan was submitted to the Department in September, 1983 and was approved sometime thereafter. A permit for groundwater monitoring was issued to USS Agrichemical on September 11, 1985 and was subsequently withdrawn on October 23, 1985. A second permit for groundwater monitoring was issued on June 19, 1986.

Groundwater quality problems have been reported in the surficial aquifer as follows:

Primary Drinking Water Standards

Contaminant	<u>Concentration</u>	Standard
sodium	245 mg/L	160 mg/L

Secondary Drinking Water Standards

Contaminant	<u>Concentration</u>	<u>Standard</u>
sulfate	1332 mg/L	250 mg/L
TDS manganese	3131 mg/L .59 mg/L	500 mg/L .05 mg/L

USSAC Fort Meade

The facility includes sulfuric acid plants, phosphoric acid plants, triple superphosphate plants and a gypsum stack/cooling pond complex on approximately 1000 acres near Fort Meade in Polk County. Operations at the facility began in 1961.

A groundwater monitoring plan was submitted to the Department in September, 1963 and was approved sometime thereafter. A permit for groundwater monitoring was issued to USS Agrichemical on September 9, 1985 and was subsequently withdrawn on October 23, 1985. A second permit for groundwater monitoring was issued on July 14, 1986.

Groundwater quality problems have been reported in the surficial aguifer at the site as follows:

Secondary Drinking Water Standards

Contaminant	Concentration	Standard
iron manganese	11.4 mg/L .12 mg/L	.3 mg/L .05 mg/L

Estech

The facility began operation in 1948 and ceased operation in 1968. Little information is available in Department files as to the nature of the facility operation.

A groundwater monitoring plan was submitted to the Department in September, 1983 and was approved in August, 1984. A permit for groundwater monitoring was issued to Estech on September 11, 1985 and was subsequently withdrawn on October 23, 1985. A second permit for groundwater monitoring was issued on May 19, 1986.

Groundwater quality problems have been reported in the Intermediate aquifer at the site as follows:

Primary Drinking Water Standards

Contaminant	Concentration	<u>Standard</u>	
gross alpha combined radium	26.2 pCi/L 13.6 pCi/L	15 pCi/L 5 pCi/L	

Groundwater quality problems have been reported in the surficial aquifer at the site as follows:

Primary Drinking Water Standards

Contaminant	<u>Concentration</u>	<u>Standard</u>	
sodium gross alpha	441 mg/L 54.1 pCi/L	160 mg/L 15 pCi/L	
combined radium	14.3 pCi/L	5 pCi/L	

Secondary Drinking Water Standards

<u>Contaminant</u>	<u>Concentration</u>	<u>Standard</u>	
sulfate	1860 mg/L	250 mg/L	
TDS	3300 mg/L	500 mg/L	
iron	18 mg/L	.3 mg/L	
manganese	1.1 mg/L	.05 mg/L	

IMC_P-21

The facility was in operation during the late 1950s and early 1960s, and little information is available as to the nature of past operations.

A groundwater monitoring plan was submitted to the Department in March, 1985 and was approved in May, 1985. A permit for groundwater monitoring was issued to IMC on September 11, 1985, and was subsequently withdrawn on October 23, 1985. A second permit for groundwater monitoring was issued on March 11, 1986.

Groundwater quality problems have been reported in the surficial aguifer at the site as follows:

Secondary Drinking Water Standards

<u>Contaminant</u>	<u>Concentration</u>	<u>Standard</u>
sulfate	1431 mg/L	250 mg/L
TDS	2175 mg/L	500 mg/L
iron	125.4 mg/L	.3 mg/L
manganese	.78 mg/L	.05 mg/L

Royster, Mulberry

The facility includes sulfuric acid plants, phosphoric acid plants and a gypsum stack/cooling pond complex on approximately 1000 acres near Mulberry in Polk County. No records are available as to when operations began at the facility.

A groundwater monitoring plan was submitted to the Department in December, 1983 and was approved in January, 1984. A permit for groundwater monitoring was issued to Royster on September 11, 1985 and was subsequently withdrawn on October 23, 1985. A second permit for groundwater monitoring was issued on July 9, 1986. An application for a construction permit to expand the gypsum stack/cooling pond complex was submitted to the Department in April, 1987, and a construction permit for the expansion was issued to Royster in March, 1988.

Groundwater quality problems have been reported in the surficial aquifer at the site as follows:

Secondary Drinking Water Standards

<u>Contaminant</u>	<u>Concentration</u>	<u>Standard</u>	
iron	5.9 mg/L	.3 mg/L	
pH	5.8 SU	>6.5 SU	

No problems have been reported for the Intermediate aguifer monitor wells, however the well completion reports indicate that the Intermediate aguifer monitor wells are in fact completed in the Florida aguifer. Thus no monitor wells have been installed so as to monitor groundwater quality in the Intermediate aguifer.

Groundwater quality problems have been reported in the surficial aguifer at the site as follows:

Primary Drinking Water Standards

Contaminant	<u>Concentration</u>	Standard	
sodium	258.9 mg/L	160 mg/L	
gross alpha	30.3 pCi/L	15 pCi/L	

Secondary Drinking Water Standards

Contaminant	<u>Concentration</u>	Standard
sulfate	1424 mg/L	250 mg/L
TDS	4292 mg/L	500 mg/L
iron	45.6 mg/L	.3 mg/L
manganese	1.36 mg/L	.05 mg/L

Enforcement action has not been initiated against American Cyanamid.

IMC New Wales

The facility includes sulfuric acid plants, phosphoric acid plants granulated triple superphosphate plants and a gypsum stack/cooling pond complex on approximately 1600 acres near Nichols in Polk County. Operations began at the facility in 1975.

A groundwater monitoring plan was submitted to the Department in September, 1983 and was approved in February, 1984. A permit for groundwater monitoring was issued to IMC on September 9, 1985 and was subsequently withdrawn on October 23, 1985. A second permit for groundwater monitoring was issued on March 19, 1986. An application for an expanded gypsum stack/cooling pond complex was submitted by IMC on August 31, 1988.

No groundwater problems have been reported in the surficial aquifer at the facility property boundary. The following groundwater problems have been reported for the Intermediate aquifer, however the appropriateness of the monitor well construction is in question:

Primary Drinking Water Standards

<u>Contaminant</u>	<u>Concentration</u>	<u>Standard</u>	
sodium gross alpha	1030 mg/L 20 pCi/L	160 mg/L 15 pCi/L	
combined radium	15.2 pCi/L	5 pCi/L	

CONSOLIDAIED WILLER ...

FEED SUPPLEMENT DIVISION

September 16, 1987

Mr. Sam Sahebzamamni, P.E.
Industrial Waste Programs
Department of Environmental Regulations
4520 Oak Fair Boulevard
Tampa, Florida 33610-7347

Dear Mr. Sahebzamani:

In accordance with the terms of Permit 1041-129068A, we are tran herewith the third quarterly report for 1987 of the groundwater wells at Piney Point. All the wells exceed the MCL for several secondary parameters. With exception of well no. 6, the MCI primary parameters were generally not exceeded.

As pointed out in the letter transmitting the report in Jun is an apparent contamination problem with well MW-6, several particle. To repeat - this well is 65 feet deep, cas feet. The casing-may have a break causing contamination. is located very close to a deep seepage ditch which could have on the results experienced. We again propose that MW-6 be plugged and that another location be selected to monitor the intaguifer.

As mentioned previously, we are anxious to pursue a solution your concurrence to select a different site for a new MW-6 look forward to your reply.

Yours very truly,

John G. Cladakis Senior Vice President an

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Operations Manager Piney Point Complex

mp

cc: Mr. W. L. Priesmeyer

Mr. B. V. Galloway

Mr. B. Barrison

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PARAMETER MONITORING REPORT (Rule 17-3.402, 17-3.404 - 17-3.406)

HS #	4041 A 1 3768	Sample Date 7/29/8
4onitoring	Well #	Well Type: [] Backg
tell_Name_	MW-4	[] Inter
lassifics	tion of GroundweterG-II	(x) Surf
	oped® Prior to lection (Yes/No) YES	Water Level from Top of Pipe

	PRIMARY STA	NDARDS				
ORET	Parameter : Monitored	Sempling Method	Analysis Method	Analysis Result	Units	Sample Filtered/Unfiltered
	Arsenic	(1)	(2)	< .01	ma/1	unfiltered
	Cadmium	(1)	(2)	.00	mq/l	unfiltered
	Chromium	(1)	(2)	.02	mq/l	unfiltered
1	Lead	(1)	(2)	.02	mg/l	unfiltered
1	Nitrate (ASN)	(1)	(2)		mq/1	unfiltered
1	Sodium	(1)	(2)	35.0	mg/l	unfiltered
l	Fluoride	(1)	(2)	1.3	mg/1	unfiltered
1	Gross Alphs	(1)	(2)	< 2.0 €	pCi/l	unfiltered
	R 226	(1)	(2)	N.R.	pCi/1	unfiltered
1	Ba 228	(1)	(2)	N.R.	pCi/l	unfiltered
}	Secondary Sta	ndards				
	Chloride	(1)	·(2)	57.0	mq/l	unfiltered
	Color	(1)	(2·)	.105.0	cl-pt	unfiltered
	Copper	(1)	(2)	.01	ma/1	unfiltered
. }	Iron	(1)	(2)	.60	mg/l	unfiltered
.]	Manganese	(1)	(2)	.06	mg/1	unfiltered
1	. pR≟.	(1)	(2)	6.1		unfiltered
	Sulfate	(1)	(2)	162.0	mq/1	unfiltered
1	.TDS	(1)	(2)	726.0	mg/1	unfiltered
	7inc	(1)	(2)	.01	mq/1	unfiltered
.	Corrosivity	(1)	(2)	+1.3	Langelier	unfiltered
!	Foaming agents	; (1)	(2)	-	MRAS	unfiltered
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(2) N.O. (1) unfiltered 11 development is the process of pumping the well prior to sampling in order to resentative ground water sample.

orm 17-1.216(2) ective January 1, 1983

Page 2 of 3

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State of Florida

DEPARTMENT OF ENVIRONMENTAL REGULATION

Interoffice Memorandum



TO:

Sam Sahebzamani

Southwest District

THROUGH:

Richard Garrity

Southwest District

Richard Harvey
Division of Water Patrities

FROM:

Al Bishop

Point Source Evaluation Section

OCT 0 5 1988

DATE:

September 28, 1988

BOUTH WEST DISTRICT

SUBJECT:

WQBEL for Royster Phosphate Piney Point Facility (formerly CM

(Manatee County)

We were recently contacted by Mr. Ivan Nance of Royster Phosphates, Inc informed us that Royster had purchased the Consolidated Minerals, Inc. Piney Point facility. He said that he wanted to reinitiate the WQBEL L analysis for the Piney Point discharge because Royster would like to be permitted to discharge from outfall 003 at "normal" high flow condition had earlier terminated WQBEL development for the Piney Point discharge request of CMI who had agreed to a modification of their permit (IO41-1 to only allow discharge following back to back 25 year storm events. I of the Level II analysis, we had recommended that the operating permit amended to require CMI to provide rainfall data from the Ruskin weather each time they reported a discharge from 003.

In light of Mr. Nance's request to reinitiate WQBEL development, we now recommend that the permit remain in effect without modification. As st in the permit, Royster is now proceeding with the WQBEL development pro should be allowed to discharge at the limits specified in the permit.

We have already been in contact with Royster's consultant, Conservation Consultants, Inc. (CCI), and have discussed at length both the data and modeling requirements for the WQBEL study. Daryll Joyner of my staff m site visit on September 7, 1988 to survey the receiving waters and to h with plan of study development. CCI is currently writing a draft plan for our review. We will provide you with a copy of the draft plan when available and will keep you apprised of all progress on the project.

If you have any questions or comments regarding the Level II analysis, call me or Daryll Joyner at Suncom 278-0780.

AB/DJ/cc



LEVEL

NOTEBOOK NO. 311

P.M.: Mancier Good



LOGBOOK REQUIREMENTS REVISED - NOVEMBER 29, 1988

NOTE: ALL LANGUAGE SHOULD BE FACTUAL AND OBJECTIVE

- Record on front cover of the Logbook: TDD No., Site Name, Site Location, Project Manager.
- All entries are made using ink. Draw a single line through errors. Initial and date corrections.
- Statement of Work Plan, Study Plan, and Safety Plan discussion and distribution to field team with team members' signatures.
- 4. Record weather conditions and general site information.
- Sign and date each page. Project Manager is to review and sign off on each logbook daily.
- Document all calibration and pre-operational checks of equipment. Provide serial numbers of equipment used onsite.
- Provide reference to Sampling Field Sheets for detailed sampling information.
- Describe sampling locations <u>in detail</u> and document all changes from project planning documents.
- Provide a site sketch with sample locations and photo locations.
- Maintain photo log by completing the stamped information at the end of the logbook.
- If no site representative is on hand to accept the receipt for samples, an entry to that effect must be placed in the logbook.
- 12. Record I.D. numbers of COC and receipt for sample forms used. Also record numbers of destroyed documents.
- 13. Complete SMO information in the space provided.

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STATE OF FLORIL

DEPARTMENT OF ENVIRONMENT

John G. Cladakis Senior Vice President CONSOLIDATED MINERALS, INC. County: Manatee Post Office Box 908 Palmetto, FL 33561

PERMIT/CERTIFICATION

ID Number: 4041P200017

Permit No.: IO41-129068 Expiration Date: May 11

Latitude: 27° 37' 24" Longitude: 82° 31' 54"

Project: Phosphatic Fertilizer

Plant Wastewater

Treatment and Discharge

This permit is issued under the provisions of Chapter 403, Florida Statutes, and Florida Administrative Code Rules 17-3, 17-4 & 17-6. The above named permittee is hereby authorized to perform the work or operate the facility shown on the application and approved drawing(s), plans, and other documents, attached hereto or on file with the department and made a part hereof and specifically described as follows:

The facility consists of phosphoric acid, sulfuric acid and diammonium phosphate plants. Calcium sulfate, which is generated as a by-product in the phosphoric acid production process, is stored at the site. The calcium sulfate transport water and scrubber water from the phosphoric acid and diammonium phosphate plants make up the process wastewater. This stream is ponded and, to the extent possible, reused. Contaminated non-process wastewater is discharged through Outfalls 001 and 002 and the process water which cannot be recycled is treated and discharged through Outfall 003. Process wastewater treatment consists of double-liming and further steps for which confidentiality has been claimed in accordance with Section 403.111, Florida Statutes. Outfalls 001 and 003 discharge to Buckeye Road drainage ditch, which becomes confluent with a southerly flowing railroad drainage ditch, which ultimately discharges into Bishop Harbor, which flows into Tampa Bay. Outfall 002 discharges to a drainage ditch and thence to Piney Point Creek, which empties into Tampa Bay. The groundwater monitoring requirements of Section 17-4.245 of the Florida Administrative Code (F.A.C.) are addressed in this permit.

Location: Immediately east of U.S. Highway 41 and approximately six (6) miles north of Palmetto, Manatee County, Florida.

Replaces Permit No.: IT41-85866B

DER Form 17-1.201(5) Page 1 of 13.

Mr. John G. Cladaki CONSOLIDATED MINERALS, FAC.

File No. 1241-129068 Page 2

When the Order (Permit) is final, any party to the Order has the right to seek judicial review of the Order pursuant to Section 120.68, Florida Statutes, by the filling of a Novice of Appeal pursuant to Rule 9.110, Florida Rules of Appeal Procedure, with the Clerk of the Department in the Office of General Counsel, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400; and by filing a copy of the Notice of Appeal accompanied by the applicable filing fees with the appropriate District Court of Appeal. The Notice of Appeal must be filed within 30 days from the date the Final Order is filed with the Clerk of the Department.

Executed in Tampa, Florida.

Sincerely,

Henry B. Dominick Permitting Engineer

Industrial Waste Program

HBD/aa

Attachment: As stated

cc: W. L. Priesmeyer, MCHD

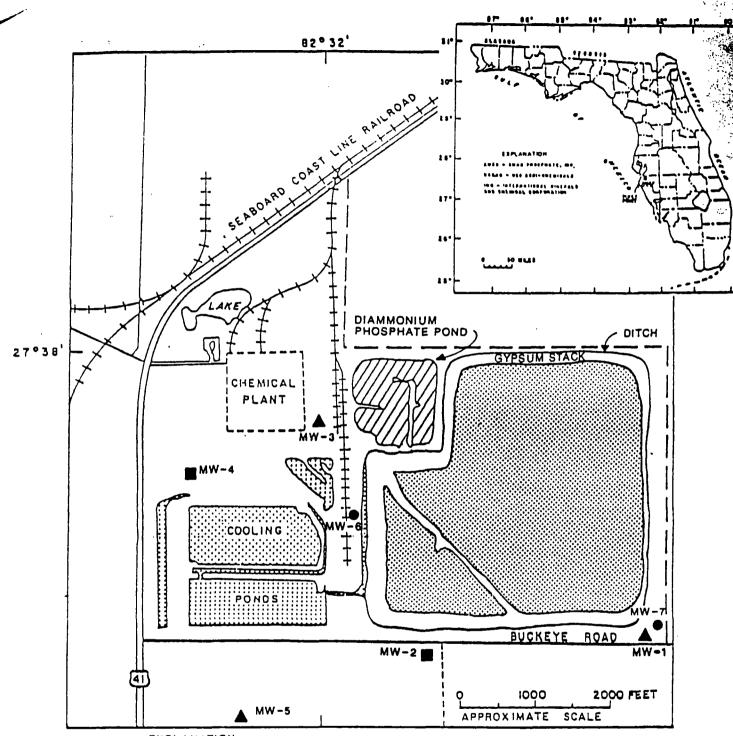
Southwest District Groundwater

CERTIFICATE OF SERVICE

This is to certify that this NOTICE OF PERMIT and all copies were mailed before the close of business on May 15, 1987 to the listed persons.

FILING AND ACKNOWLEDGEMENT FILED, on this date, pursuant to Section 120.52(10), Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.

Clerk Date



EXPLANATION

MW-1 NEWLY INSTALLED SURFICIAL AQUIFER MONITOR-WELL LOCATION AND NUMBER

MW-2
EXISTING SURFICIAL AQUIFER
MONITOR-WELL LOCATION AND NUMBER

MW-7 EXISTING INTERMEDIATE AQUIFER

MONITOR-WELL LOCATION AND NUMBER



REFERENCE # 6

FEB 2 7 1987

SOUTH WEST DISTRICT

TAMPA

February 25, 198

Mr. Dale Twachtmann
Secretary
Florida Department of
Environmental Regulation
Twin Towers Building
2600 Blair Stone Road

RE: Request for Conductivity Variance

AMAX Chemical Corporation, Piney Point Complex

Industrial Wastewater Permit

Dear Mr. Twachtmann:

Tallahassee, FL 32301

AMAX Chemical Corporation is currently operating its industrial wastewater system under temporary operating permit number IT41-85866 B which expires March 4, 1987. Application for an operating permit was filed on January 2, 1987. Included in the existing permit is a variance for specific conductivity, granted for Outfall 003 under DER File No. VE-41-181 which expires April 25, 1987. AMAX Chemical Corporation is hereby applying for a renewal for Specific Conductivity at Outfall 003.

AMAX's Piney Point Complex is located in the northwest section of Manatee County, approximately one-quarter mile inland from Tampa Bay. The Complex has three surface water outfalls; two are non-process discharges (001 and 002) and the third (003) discharges treated process water. One non-process outfall (002) flows northward into Cockroach Bay, a saltwater estuary, while the other non-process outfall (001) and the treated process water outfall (003) flow southward into the marine waters of Bishop Harbor.

The receiving water for the south surface outfalls (001 and 003) is a man-made roadside drainage ditch that flows initially westward for approximately 600 meters below the AMAX outfalls and turns south in a railroad drainage ditch for approximately 1900 meters where it enters Bishop Harbor. This salt water body is typical of Florida marine waters and has conductivity values well in excess of AMAX's effluent.

16 pand our Comments to Tally-

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Mr. Dale Twachtmann Secretary Florida Department of Environmental Regulation February 25, 1987 Page Two

AMAX requests that the Department grant a variance from the requirements of 17-3.06(2)(0), Florida Administrative Code and 403.201, Florida Statutes, to allow the discharge of water with higher conductivity than allowed by the Water Quality Standards established for Class III waters of the State. Paragraph 17-3.061(2)(0) F.A.C. states: "Specific Conductance -- shall not be increased more than 100% above background levels or to a maximum level of 500 micromhos per centimeter in surface waters in which the specific conductance of the water at the surface is less than 500 micromhos per centimeter; and shall not be increased more than 50% above background level or to a maximum level of 5,000 micromhos per centimeter in surface waters in which the specific conductance of the water at the surface is equal to or greater than 500 micromhos per centimeter but less than 5,000 micromhos per centimeter."

The background specific conductance of the receiving water, based on an average of maximum values over the past eleven (11) months, is 1,468 micromhos per centimeter. The specific conductance of the treated process water discharge is approximately 4,400 (average) and 5,500 (maximum) micromhos per centimeter.

Approximately 2,500 meters downstream the receiving body mixes with the salt waters of Bishop Harbor. Although we have not performed recent studies on conductivity values in Bishop Harbor, it is a well known fact that salt water values are considerably higher than found in the AMAX discharge waters. Work carried out by the company in 1983 and 1984 found that specific conductance values in Bishop Harbor varied between 10,000 and 40,000 micromhos per centimeter approximately 2,500 meters downstream from the AMAX discharge. It is not believed that AMAX's discharge will significantly affect the naturally occurring high specific conductance values in Bishop Harbor. AMAX employs double-lime treatment and an ammonia removal process prior to discharging treated process water. There appears to be no economical method for further reducing the specific conductance of the treated process water effluent.

Anticipating additional questions AMAX offers the following 403.201 Florida Statute response:

Mr. Dale Twachtmann
Secretary
Florida Department of
Environmental Regulation
February 25, 1987
Page Three

1. We believe that this variance request is made pursuant to Chapter 403.201(1)(a) and (c). There is no practicable means known or available for adequate control of the pollution involved. As important, however, even if such means existed, is the fact that it would be impractical from both economic and environmental standpoints to reduce the specific conductance in the discharge to within allowable limits in the receiving body of water because within 2,500 meters, it enters Bishop Harbor where specific conductance values range from 10,000 to 40,000 micromhos per centimeter. The effluent flow route is described above. Thus, even if practicable water treatment technology becomes available to reduce the specific conductance of the effluent, no environmental improvement would result from the company installing such treatment technology.

AMAX investigated water treatment alternatives to reduce the levels of conductivity in the treated process water discharge in 1984 which included ion-exchange, reverse osmosis, dilution and other treatment technologies. None of the technologies available could be practically applied. Additionally, current inquiries have revealed no breakthrough techniques. AMAX believes that this explanation supports the applicability of sub-paragraphs (a) and (c).

- AMAX requests a long term variance (at least life of permit) supported by the following.
 - a. This ditch/canal system used to transport the effluent from the NPDES outfalls to Bishop Harbor is not a natural system containing high levels of habitat diversity. These waterways were built to drain Buckeye Road, U.S. Highway 41, a railroad line, and agricultural fields used for pasture, sod growing, tomatoes, ornamentals and citrus. Flow upstream of AMAX's outfalls contains elevated levels of conductivity when irrigation runoff or rainfall triggers a flow event.
 - b. No adverse effects will result in the Bishop Harbor ecosystem as a result of AMAX's effluent as it already contains naturally occurring elevated levels of specific conductance.

Mr. Dale Twachtmann
Secretary
Florida Department of
Environmental Regulation
February 25, 1987
Page Four

- c. Current technology to reduce specific conductance levels in the effluent is not practicable. Even if such technology becomes available, the need to reduce specific conductance levels is not appropriate because AMAX's effluent contains insignificant levels when compared to water in Bishop Harbor.
- 3. What level of specific conductance can be met in the treated process water discharge?

Untreated process water has conductivity values of approximately 9,000 micromhos per centimeter. Double-lime treated process water typically contains less than 6,000 micromhos per centimeter. AMAX's experience utilizing its proprietary tertiary treatment system ranged from 3,700 to 5,500 micromhos per centimeter. During this entire period of data collection the production facilities have been shut down. Allowing for variation during normal operation continues to suggest a level of 6,000 micromhos per centimeter as a reasonable level of specific conductance.

Thus, we believe the variance should be issued authorizing the release of treated process water less than 6,000 micromhos per centimeter.

17-103.100 Response:

- a. addressed above
- b. addressed above
- c. addressed above
- d. addressed above
- e. addressed above
- f. and g. require a discussion of the social, economic and environmental impacts on the company, residents of the area and of the state if the variance is granted or if the variance is denied. The following addresses these issues:

Mr. Dale Twachtmann
Secretary
Florida Department of
Environmental Regulation
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Page Five

Social Impacts: The ditch/canal system functions principally to drain land in support of agricultural, transportation, and manufacturing activities. Fishing and other recreational uses have not been observed by AMAX in the ditch system because most residents choose to do so either in larger freshwater streams where flow is continuous or in Bishop Harbor where no environmental impacts will be caused by issuance of the variance. Thus, AMAX cannot identify any significant social impacts upon area residents or the state caused by issuance of the variance.

Denial of the variance also would have limited potential impacts upon residents of the area and the state. As described above, denial of the variance would not result in an ecosystem capable of supporting commercial or recreational uses of the ditch/canal system which are not present currently. Because Bishop Harbor will not be impacted by Department action upon AMAX's request, denial of the variance would have no favorable social consequences upon residents of the area or the state.

Economic Impacts: The principle impact of the Department's decision is economic. Due to the environmental characteristics of the ditch/canal system and Bishop Harbor, a requirement to soften the effluent (should the variance be denied) will impose an unnecessary, multi-million dollar hardship on a facility that has not produced for economic reasons since January, 1985. Denial of the variance will not create an ecosystem capable of generating economic gains to offset AMAX's hardship.

Environmental Impacts: AMAX believes denial of the variance, independent of the question of available treatment technology, would not produce significant environmental benefits because the receiving ditch/canal system is man-made, intermittent, of low ecological diversity, and contains elevated conductivity values due to upstream activities as well as tidal effects in the ditch/canal.

Once AMAX's effluent reaches Bishop Harbor, approximately 2,500 meters downstream of AMAX's NPDES outfalls, no environmental benefits would accrue from denial of the variance because the marine waters of Bishop Harbor contain specific conductance levels far greater than AMAX's effluent. Thus, the environmental benefits of denial are limited to the 2,500 meters of ditch/canal system constructed to drain runoff from agricultural lands, highways, and a railroad. It is difficult to identify meaningful environmental benefits in this case.

Mr. Dale Twachtmann Secretary Florida Department of Environmental Regulation February 25, 1987 Page Six

Issuance of the variance will result in the conductivity of the canal/ ditch system to increase somewhat for 2,500 meters of its length, where mixing with water from Bishop Harbor will cause the conductivity levels to rise to 40,000 micromhos per centimeter. Because it is highly unlikely that aquatic organisms in the canal system are not acclimated to marine waters, issuance of the variance should not adversely affect the aquatic diversity.

The probability of any reduction in diversity is also slight because intermittent flow in the system has already prevented the development of a highly diverse natural ecosystem. Equally important is the system's history of receiving agricultural and highway runoff containing elevated levels of conductivity.

Thus, AMAX believes environmental impacts from issuance of the variance will be limited to theoretical discussions which will be unsupportable by field evidence.

We feel the evidence strongly supports the extension of our request for extending, long term, a variance for specific conductance. If you have any questions, please let me know. Your prompt consideration is appreciated.

Yours very truly,

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John G. Cladakis

Senior Vice President and

Operations Manager

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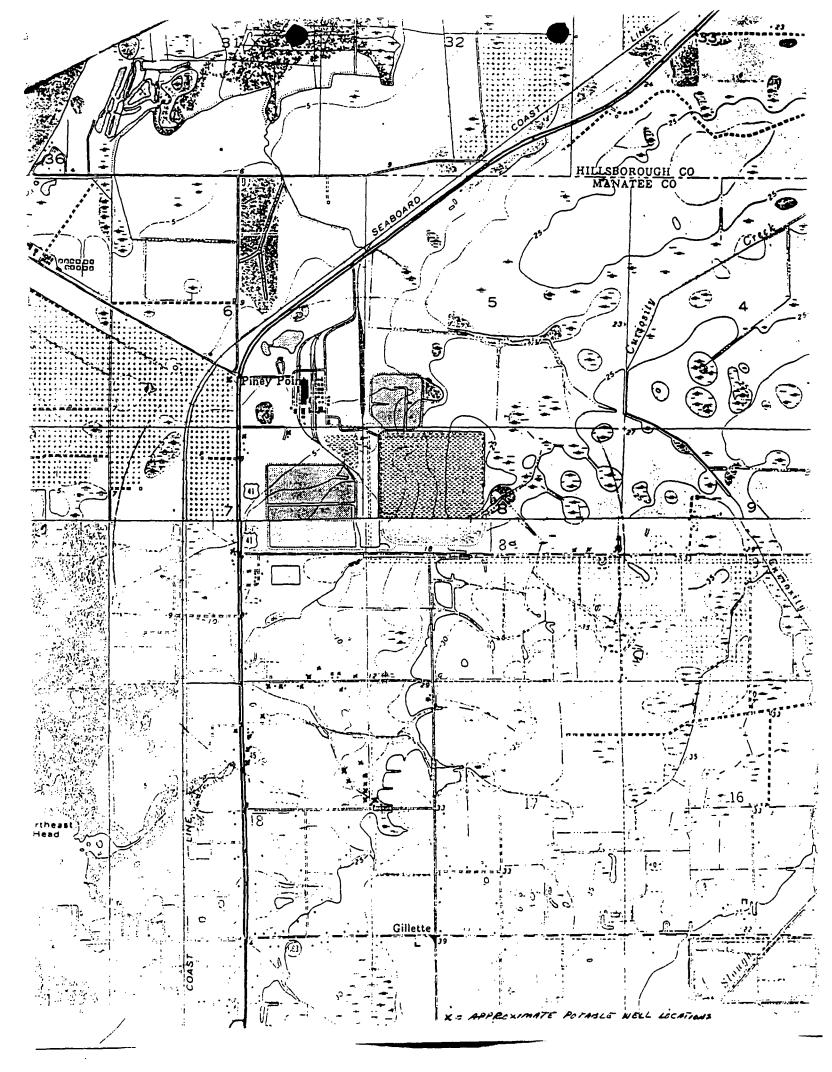
cc: Mr. Peter McGarry, EPA

Mr. William Priesmeyer, Manatee County

Dr. Richard Garrity, D.E.R., Tampa

Mr. Larry Schwartz, D.E.R., Tallahassee

Mr. Bruce V. Galloway, AMAX



PART III - INDUSTRIAL 😥	"TEXTTER	TREATHERS	DCES
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1.	Type of Industry	Phosphate	Fe.		r
2.	SIC Code <u>2874</u>			TO THE COURSE OF THE MEDICAL SECTION AND ADMINISTRAL SECTION AND ADMINISTRAL SECTION AND ADMINISTRAL SECTION ASSESSMENT AND ADMINISTRAL SECTION ASSESSMENT	

4. Production Rate 2000 tons/day sulfuric acid; 542 tons/day 100% P205;
750 tons/day DAP tons/day, lbs/day, etc.

* 5. Normal Operation 24 hours per day/7 days per week/52 weeks per year hrs./day, days/week

6. If operation is seasonal, explain __Not Applicable

- 8. Describe wastewater treatment process and identify treatment units.

 003 The effluent receives two-stage lime treatment for removal of fluorides and phosphates. The alkaline effuent is clarified, ammonia is removed and then acidulated to near neutral pH and discharged.
- C. List sludge or slurry treatment units.

(Not applicable)

D. Describe volume, composition and disposal method of sludge. Identify location(s) of ultimate disposal.

The two-stage treatment process generates sludge consisting of calcium fluoride and calcium phosphate. Volume is a function of the need for treatment and discharge of effluent. Sludges are disposed of in the gypsum disposal area.

E. Method(s) and Location(s) of Flow Measurement.

Non-process outfalls 001 and 002, as well as the treated process water outfall 003 have 90 degree v-notch weirs and continuous flow analyzers.

F. Describe practices to be followed to ensure adequate waste treatment during emergencies such as power loss and equipment failures causing shut down of pollution abatament equipment of the proposed/permitted facilities.

Both the two-stage liming process and the acidulation process have malfunction alarms. These alarms are designed to alert plant personnel to malfunctions or failures in the system. Power failure systems will rely on battery backup for power.

G. Laboratory: List tests for which equipment/chemicals are provided, or contract laboratory to perform analysis.

P,F,pH,N, and suspended solids. The parameters are analyzed in accordance with EPA approved methods. When it is necessary to analyze parameters beyond the capability of the on-site laboratory, either a Company lab at DER Form 17-1.204(2) another location or a certified commercial laboratory is Effective November 30, 1982

Page 4 of 9 utilized.

*Due to economic considerations, this facility was shut down in January, 1985 and has not operated since that time. (12/86)

PART V - EFFLUENT DISPOSAL

	1.	Ina	mediate receiving body of water (RBW):			
		a.	Name _ Buckeye Road Drainage Ditch			
		ь.	Type of receiving water: [X] Fresh [] Salt or brackish			
			[X] Drainage Ditch [] Landlocked Lake [] Canal [] Lake with Outfall [] Creek [] Tidal Estuary [] River [] Ocean or Gulf [] Other (Specify)			
		c.	Classification of receiving water (in accordance with Rule 17-3); Class III			
		d.	Minimum 7-day 10 year low flow of the RBW at the discharge point (if appropriate): Not Available efs			
		e .	Identify and describe the flow of effluent from the point of discharge to a major body of water. A suitably marked map or aerial photograph may be used.			
	2.	Qut	Discharge flows into Buckeye Road Drainage Ditch westward to southerly flowing railroad drainage d			
		a.	Discharge location: Which ultimately discharges into Bishop Harbor			
			Latitude 27 . 37 . 24 "N Longitude 82 31 54 "W			
		b.	Design configuration and construction materials: Effluent discharges from an underground concrete pipe into rectangular concrete spillway equipped with a 90° V-notch weir.			
		c.	Distance from shore: Not Applicable			
		d.	Diameter: 90 Degree V-Notch Weir			
		٠.	Elevation of discharge invert: Not Applicable MSL			
		r.	Receiving water bottom depth at point of discharge: 2" - 20." (Est) MSL			
	3.	Do	you request a mixing zone (refer to Fla. Admin. Code Rule 17-4.244)? If yes, what parameters or pollutants?			
			Current circumstances do not dictate the need for a mixing zone Should future operations develop the need for a mixing zone, a request will be made at that time.			
8.	If	eff1	uent is discharged to groundwater, complete the following: Not Applicable			
	1.		posal method: [] Slow Rate [] Percolation/Evaporation Pond [] Rapid Rate [] Combination (specify) [] Overland Flow [] Other (specify) [] Absorption Field			
hen	for	R	ee attached Copy of USGS Map. Discharge flows west in Buckeye oad drainage ditch to railroad ditch where it flows southward _1.204(2) into Bishop Harbor which flows into Tampa Bay.			

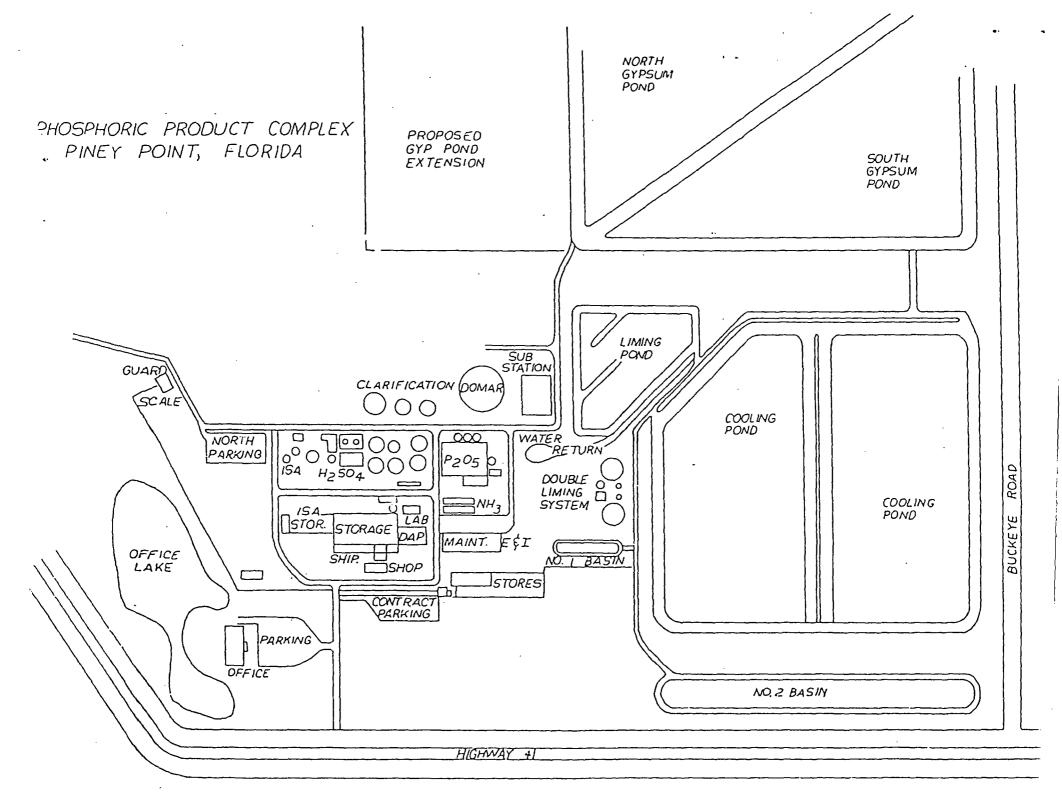
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Effective November 30, 1982

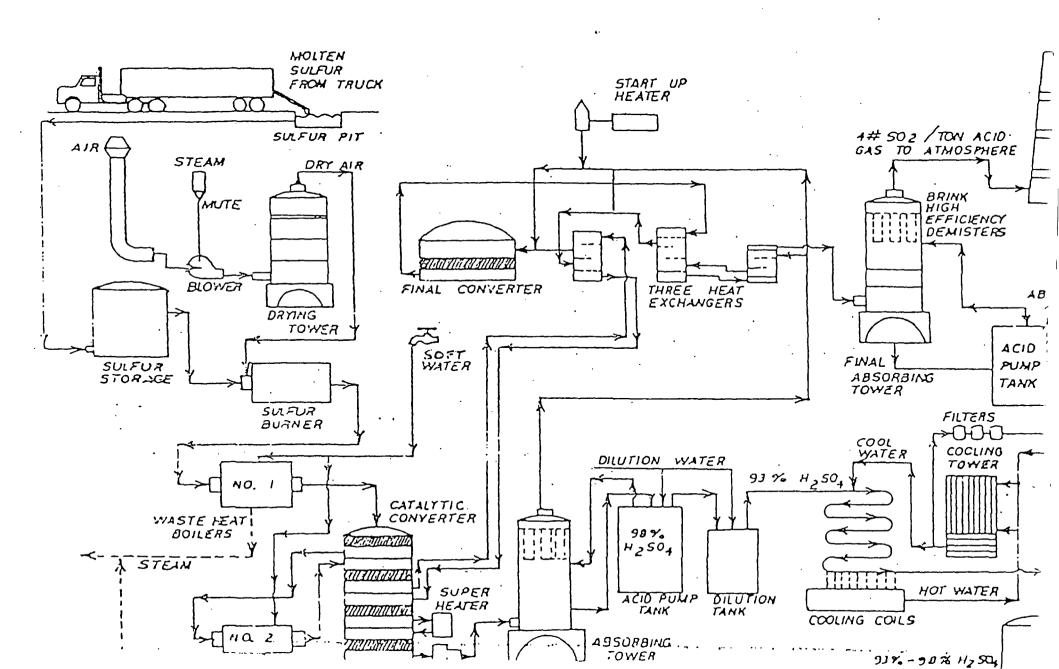
Royster Phosphates, Inc.

P. O. Box 1329 Palmetto, Florida 34220

PINEY POINT PHOSPHORIC COMPLEX MANATEE COUNTY, FLORIDA



Royster Phosphates, Inc. SULFURIC ACID PLANT (H2504) CONTACT PROCESS



Royster Phosphates, Inc.

P. O. Box 1329 Palmetto, Florida 34220

PHOSPHORIC PRODUCTS COMPLEX PINEY POINT, FLORIDA

SULFURIC ACID

THE BASIC RAW MATERIALS FOR THE MANUFACTURE OF SULFURIC ACID ARE SULFUR, AIR AND WATER. AT THIS PLANT WE BRING IN MOLTEN SULFUR BY TRUCK WHICH HAS BEEN SHIPPED BY TANKER TO TAMPA FROM LOUISIANA OR TEXAS. THE SULFUR IS BURNED IN A CONTROLLED AMOUNT OF AIR, THEN IT IS CAUSED TO REACT AD-DITIONALLY WITH OXYGEN IN THE AIR BY THE USE OF A CATALYST. THE PRODUCT FROM THIS LATTER REACTION IS ABSORBED IN SULFURIC ACID AND WATER TO PROVIDE THE CORRECT STRENGTH OF SULFURIC ACID. ALTHOUGH THE PROCESS IS CHEMICALLY SIMPLE, STRICT CONTROLS ARE NECESSARY IN ORDER TO HAVE AN ECONOMICALLY SOUND PROCESS THAT PREVENTS THE LOSS OF SULFUR COMPOUNDS TO THE ATMOSPHERE, BASICALLY, THE CONTROLS ARE ACID TEMPERATURE AND TEMPERATURE IS CONTROLLED PRIMARILY BY THE OPERATION STRENGTH. OF BOILERS AND COOLING COILS. THE ACID STRENGTH IS CONTROLLED BY ANALYSIS AND VARIOUS CONTROL INSTRUMENTS IN THE PLANT, THAT INDICATE WHEN WATER ADDITION IS NECESSARY,

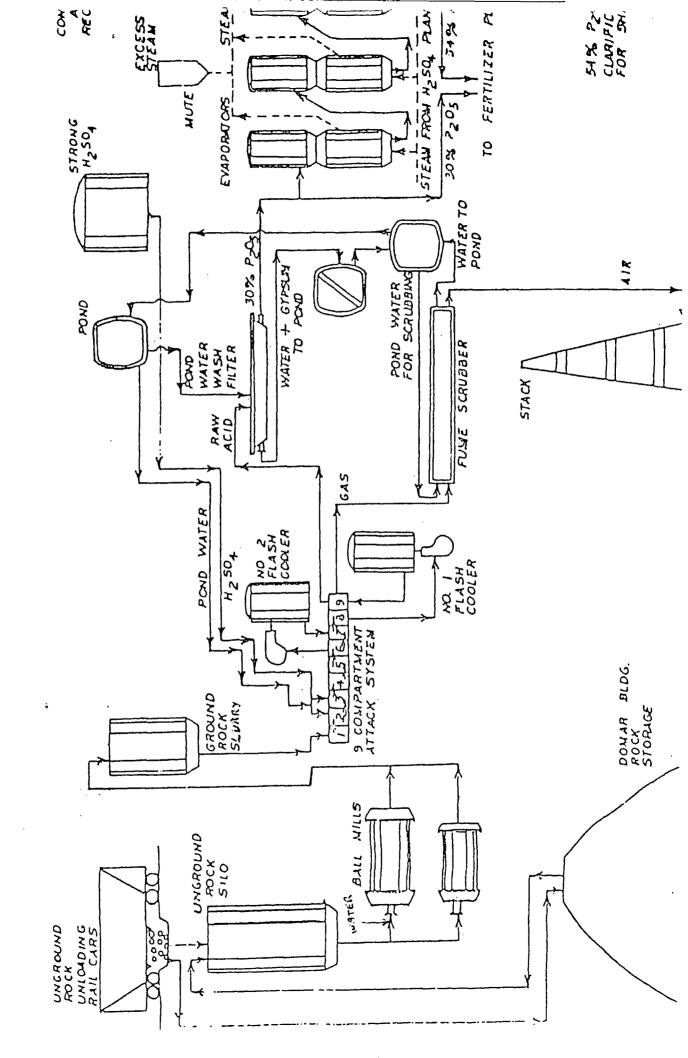
SULFURIC ACID

PAGE TWO

THIS SULFURIC ACID PLANT WAS, AT ONE TIME, THE LARGEST SINGLE UNIT PLANT IN THE WORLD AND IS STILL ONE OF THE LARGEST. THE SIZE IS ILLUSTRATED BY THE LARGE SIZES OF PARTICULAR PIECES OF EQUIPMENT IN THE PLANT. THE STEAM TURBINE DRIVEN AIR BLOWER OF 3560 HORSEPOWER AND THE MASSIVE 4-PASS CONVERTER ARE PRIME EXAMPLES.

THE THREE CYLINDRICAL TOWERS OVER THE CONTROL ROOMS ARE, THE DRYING TOWER AND NO. 1 AND 2 ABSORBING TOWERS. THE AIR ENTERING THE PLANT IS CLEANED AND DRIED IN THE DRYING TOWER. THE TWO TALLER TOWERS ARE THE ABSORBING TOWERS, MECHANICALLY IDENTICAL TO THE DRYING TOWER. THEIR GREATER HEIGHT IS USED TO ACCOMMODATE HIGH EFFICIENCY BRINK MIST ELIMINATORS WHICH SAFEGUARD THE ENVIRONMENT BY EFFECTIVELY ELIMINATING THE POSSIBILITY OF ESCAPING ACID MIST OR OXIDES OF SULFUR.

PROCESS PHOSPHORIC ACID PLANT (P205) WET Royster



PHOSPHORIC ACID

THE BASIC RAW MATERIALS FOR THE PRODUCTION OF PHOSPHORIC ACID ARE PHOSPHATE ROCK, SULFURIC ACID AND WATER. WE OBTAIN PHOSPHATE ROCK FROM FLORIDA MINES AND THE SULFURIC ACID FROM OUR OWN PLANT.

THE WET PHOSPHATE ROCK IS FED WITH ADDITIONAL WATER
TO ONE OF TWO BALL MILLS AND GROUND INTO A SLURRY RESEMBLING SOFT ICE CREAM. THE ROCK SLURRY IS THEN PUMPED
FROM THE MILL DISCHARGE TANK TO THE COMPARTMENTED PHOSPHORIC ACID REACTION TANK.

THE LIQUID SLURRY RESULTING FROM THE REACTION OF PHOSPHATE ROCK AND SULFURIC ACID IS FILTERED ON AN ELABORATE, CONTINUOUS FILTER AND PHOSPHORIC ACID IS REMOVED FROM THE FILTER AS PRODUCT. THE SOLIDS REMOVED BY THE FILTER ARE ESSENTIALLY GYPSUM (CALCIUM SULFATE DIHYDRATE) AND THIS MATERIAL IS TRANSPORTED AS A WATER SLURRY FROM THE FILTER TO A GYPSUM SETTLING POND. THE ACID PRODUCT FROM THE FILTER CONTAINS APPROXIMATELY 30% P205. (PHOSPHORIC ACID STRENGTH IN THE FERTILIZER INDUSTRY IS UNIVERSALLY ANALYZED AND REPORTED AS PERCENT P205. FROM A STRICT CHEMICAL POINT OF VIEW, THE 30% P205 PRODUCT IS ACTUALLY ABOUT 41% STRENGTH AS ORTHO PHOSPHORIC ACID, H3P04.)

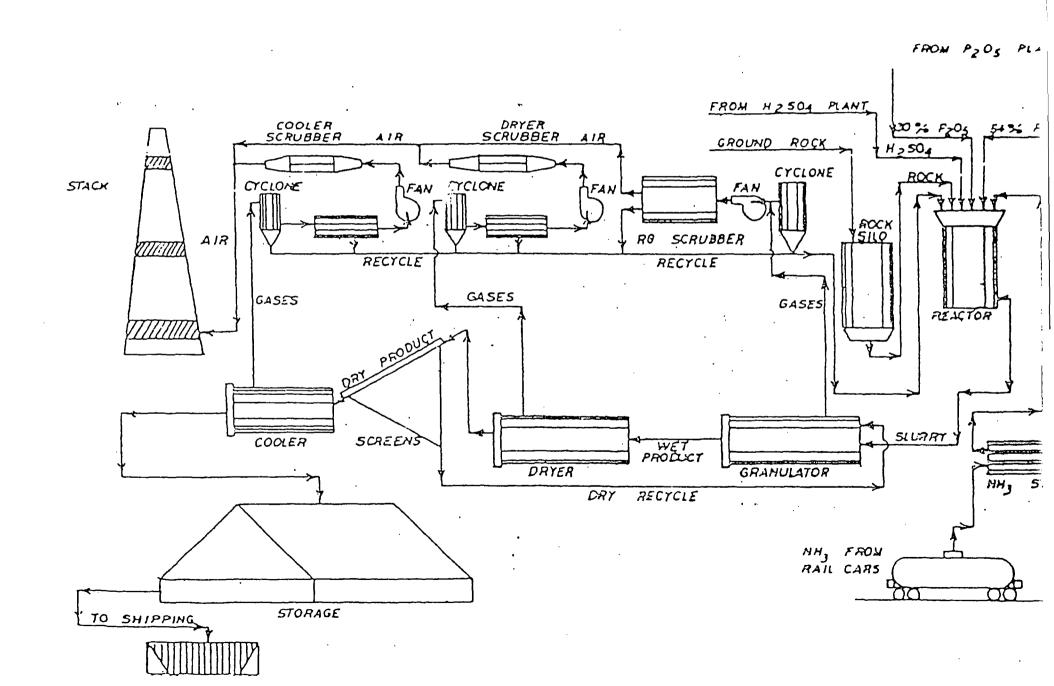
PHOSPHORIC ACID

PAGE TWO

THE 30% ACID IS CONCENTRATED TO ABOUT 54% P205 IN THREE (3) VACUUM EVAPORATORS TO MAKE A PRODUCT MORE SUITABLE FOR SHIPMENT. THE 54% ACID IS ALLOWED TO AGE AND SETTLE BEFORE SHIPMENT. THE AGING AND SETTLING WHICH REDUCE IMPURITIES IN THE ACID, IS CARRIED OUT IN THE LARGE TANKS JUST NORTH OF THE PHOSPHORIC ACID PLANT.

EXHAUST AIR FROM THE PHOSPHORIC ACID PROCESS IS WASHED WITH RECYCLED WATER TO SCRUB OUT HARMFUL GASES BEFORE DISCHARGE FROM THE STACK.

Royster DRY PRODUCTS - DIAMMONIUM PHOSPHATE OR TRIPLE SUPER PHOSPHATE



FERTILIZER PLANT

WE MANUFACTURE DIAMMONIUM PHOSPHATE (DAP 18-46-0) IN OUR FERTILIZER PLANT. WE ALSO HAVE THE ABILITY TO PRODUCE GRANULAR TRIPLE SUPER PHOSPHATE (GTSP 0-46-0). BASICALLY THE SAME EQUIPMENT IS USED IN PRODUCING EITHER PRODUCT. ONLY THE RAW MATERIALS USED, OR THEIR PROPORTIONS, ARE CHANGED.

TO PRODUCE 18-46-0, PHOSPHORIC ACID, FROM OUR PLANT, AND ANHYDROUS AMMONIA, WHICH IS BROUGHT IN BY RAILROAD, ARE THE BASIC INGREDIENTS. IF WE WERE PRODUCING 0-46-0 WE USE PHOSPHORIC ACID FROM OUR PLANT AND BRING IN GROUND 75 BPL (75% BONE PHOSPHATE OF LIME) PHOSPHATE ROCK FROM FLORIDA MINES.

IN BOTH PROCESSES THE RAW MATERIALS ARE ADDED TOGETHER
IN A TANK WHERE THE CHEMICAL REACTIONS ARE COMPLETED AND THE
RESULTING LIQUID SLURRY IS PUMPED TO THE SOLIDS MATERIALS
HANDLING SYSTEM. IN THE SOLIDS SYSTEM THE REACTION PRODUCTS
ARE DISTRIBUTED UPON A BED OF RETURNING SOLID MATERIAL. BY
CONTROLLING THE PROPORTIONS OF REACTION PRODUCTS AND SOLID
MATERIALS WE OBTAIN CONTROL OVER THE SIZE AND APPEARANCE OF
THE FINISHED PRODUCT. AFTER THE PRODUCT HAS BEEN FORMED INTO
THE DESIRED SIZE OF GRANULES IT IS DRIED, SCREENED AND CONVEYED
TO THE PRODUCT STORAGE.

THIS PARTICULAR PLANT IS RATHER ADVANCED IN THAT THE MATERIALS HANDLING EQUIPMENT IS OF SUCH SIZE AND DESIGN THAT CONTROL OF THE PROCESSES IS CONVENIENTLY ACCOMPLISHED. IN PARTICULAR, THE DRYER IS 11' IN DIAMETER AND 90' LONG, WHICH

FERTILIZER PLANT

PAGE TWO

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MAKES IT ONE OF THE LARGEST IN THE INDUSTRY. ALSO, OUR SCREENING CAPACITY FOR SIZE CONTROL IS VERY LARGE WITH RESPECT TO THE NORMAL AMOUNT OF MATERIAL PUT OVER IT. THE ABILITY TO ACCOMPLISH SUPERIOR DRYING AND SCREENING ALLOWS US TO MAKE A PRODUCT OF EXCELLENT HANDLING AND SHIPPING QUALITY.

MATERIAL RECOVERY PLAYS A SIGNIFICANT PART IN THE EFFICIENCY OF ANY FERTILIZER PLANT. BY INSTALLING A VERY ADVANCED SCRUBBER SYSTEM WE ARE ABLE TO KEEP OUR MATERIAL LOSS AT A MINIMUM. WE HAVE TOTAL OF SIX SEPARATE SCRUBBERS TO INSURE AGAINST THE LOSS OF THE DRY PRODUCT AS DUST, AND GASEOUS EMISSIONS WHICH MIGHT CAUSE POLLUTION. THE RATHER ELABORATE MASS OF DUCTING AND EQUIPMENT ON THE WESTERN SIDE OF THE PLANT MAKE UP THE MAJOR PART OF THE SCRUBBING SYSTEM. THE SIZES AND SHAPES OF THE DUCT WORK ARE ENGINEERED FOR MAXIMUM PERFORMANCE AND THIS SOMEWHAT COMPROMISES THEIR APPEARANCE.

THE PRODUCTS FROM OUR FERTILIZER PLANT MAY, AT TIMES,

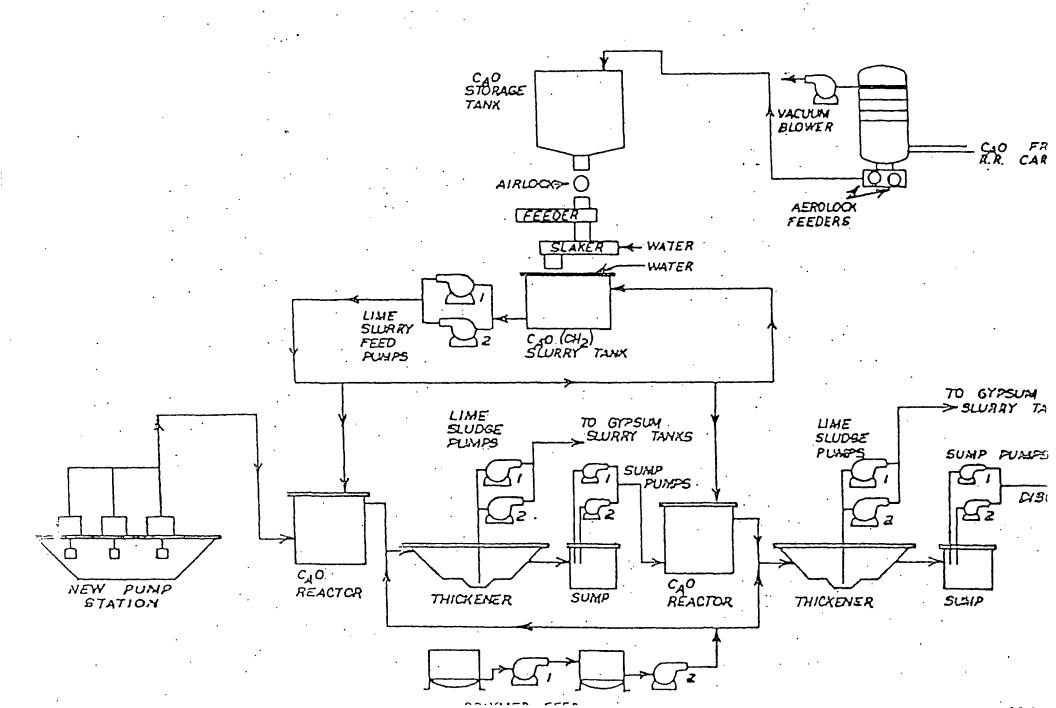
BE USED AS FINISHED PRODUCTS, BUT THEIR MAIN USE IS AS

INTERMEDIATE PRODUCTS FOR USE IN THE PRODUCTION OF OTHER

GRADES OF FERTILIZER, MOST OF THE MATERIAL IS EXPORTED, BUT

IT COULD BE SHIPPED TO FERTILIZER PLANTS IN THE UNITED

STATES.



WATER TREATMENT

IN THE PRODUCTION OF PHOSPHORIC ACID AND PHOSPHATE FERTILIZER, GASSES AND PARTICULATES (DUST OR LIQUID DROPLETS) ARE EMITTED TO THE ATMOSHPERE. THESE EMITANTS ARE CAPTURED IN WATER STREAMS WITHIN SO-CALLED SCRUBBERS. THIS WATER IS RECIRCULATED AND REUSED IN THE VARIOUS PRODUCTION PROCESSES.

PART OF THE PRODUCTION CYCLE IS THE REMOVAL OF GYPSUM FROM PHOSPHORIC ACID BY FILTRATION. THE GYPSUM COMES OFF THE FILTER AS A SOLID AND IN OUR SYSTEM IS SLURRIED WITH WATER TO BE REMOVED FROM THE PLANT TO A GYPSUM STACKING AREA. HERE THE WATER IS ALLOWED TO SEPARATE FROM THE GYPSUM AND FORMS THE RECIRCULATION WATER FOR REUSE IN THE PRODUCTION OF PHOSPHATE PRODUCTS. ONCE WATER HAS COME INTO CONTACT WITH EITHER THE GASEOUS EMISSIONS, DUST, OR GYPSUM IT IS THEN CONTAMINATED AND CANNOT BE RELEASED FROM THE PLANT SITE. THEREFORE IT IS NECESSARY TO HAVE LARGE HOLDING PONDS THAT CAN CONTAIN SEVERAL MILLION GALLONS OF WATER.

DURING MOST YEARS ALL WATER REQUIREMENTS FOR THE PHOS-PHORIC ACID COMPLEX CAN BE SATISFIED BY THE RAINFALL/EVAP-ORATION BALANCE ON THE POND SYSTEM. HOWEVER, DURING SOME RAINY PERIODS THE WATER LEVELS IN THE PONDS MAY EXCEED THE VOLUMES ESTABLISHED FOR WATER CONTAINMENT. THIS CRITICAL LEVEL IS DETERMINED BY THE AMOUNT OF STORAGE NEEDED TO CONTAIN HIGH RAINFALL EVE ITS (UP TO 10 INCHES IN 24 HOURS).

WATER TREATMENT

PAGE TWO

IN ORDER TO MAINTAIN THE WATER LEVEL BELOW THIS POINT, WATER TREATMENT FACILITIES MUST BE AVAILABLE. TREATMENT MUST TAKE WATER THAT HAS A PH OF BELOW = 3.0 AND CONTAINS LARGE AMOUNTS OF FLUORIDE AND PHOSPHORUS, AND NEUTRALIZE IT TO A PH OF 6.0 - 9.0, AND REDUCE THE FLUORIDE AND PHOSPHORUS LEVELS TO JUST A FEW PARTS PER MILLION. THE EQUIPMENT NECESSARY TO DO THIS IS CALLED A "DOUBLE LIMING" FACILITY AND INVOLVES A TWO STAGE TREATMENT OF THE WATER. THE LIME COMES INTO THE PLANT AS PEBBLE, IT IS THEN PREPREACTED WITH WATER (THIS IS CALLED SLAKING) AND SLURRIED WITH MORE WATER TO MAKE IT SUITABLE FOR WATER NEUTRALIZATION.

IN THE FIRST STAGE, LIME SLURRY AND CONTAMINATED

WATER ARE MIXED TO REMOVE THE FLUORIDE. THE SOLID MATERIAL

FORMED SETTLES FROM THE MIXTURE. THE WATER FROM THIS

STAGE THEN IS REACTED WITH MORE LIME SLURRY, IN A DIFFERENT

VESSEL, FORMING MORE SOLIDS TO REMOVE THE PHOSPHORUS. IN

EACH STAGE SOLIDS ARE FORMED AND MUST BE MECHANICALLY RE
MOVED TO PREVENT THEM FROM RECONTAMINATING THE WATER. THE

SOLIDS ARE DISPOSED WITH THE GYPSUM INTO THE STACKING AREA.

THE TREATED WATER IS THEN SENT TO A HOLDING POND FOR FINAL

CLARIFICATION BY SETTLING. IT IS PURE ENOUGH TO BE RELEASED

TO THE RECEIVING BODY OF WATER, IN OUR CASE, A SALT WATER

ESTUARY, EACH STAGE OF THE LIMING PROCESS IS MONITORED

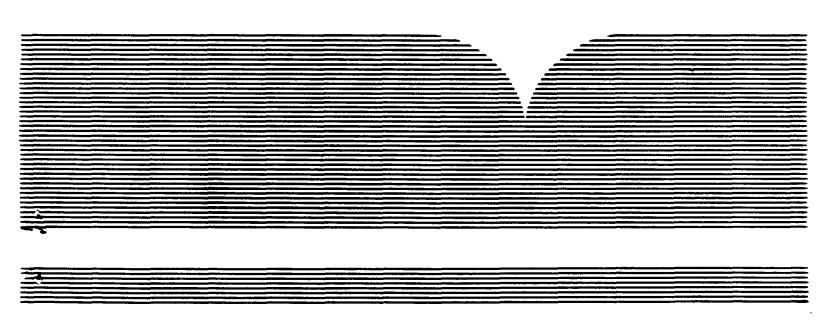
FOR PH WITH THE FINAL WATER BEING MONITORED THREE TIMES

FOR PH AND CONTAMINATES BEFORE IT IS RELEASED.

REPORT TO CONGRESS ON SPECIAL WASTES FROM MINERAL PROCESSING - SUMMARY AND FINDINGS METHODS AND ANALYSES APPENDICES

(U.S.) Environmental Protection Agency Washington, DC

Jul 90



U.S. DEPARTMENT OF COMMERCE National Technical Information Service

United States **Environmental Protection** Solid Waste and **Emergency Response** (OS-305)

EPA/530-SW-90-070C July 1990

SEPA Report to Congress on **Special Wastes from Mineral Processing**

Summary and Findings Methods and Analyses Appendices

Chapter 12 Phosphoric Acid Production

The phosphoric acid production industry consists of 21 facilities that were active as of September 1989, employed the wet phosphoric acid production process, and generated two special wastes from mineral processing: process wastewater and phosphogypsum. The data included in this chapter are discussed in additional detail in a technical background document in the supporting public docket for this report.

12.1 Industry Overview

There are two processes for producing phosphoric acid: (1) the wet process, which is a mineral processing operation and is studied here, and (2) the furnace process. Furnace process phosphoric acid production uses elemental phosphorus rather than beneficiated phosphate rock as a feedstock and, therefore, wastes generated by the process are not mineral processing special wastes according to the Agency's definition of mineral processing. Consequently, furnace process production of phosphoric acid is not within the scope of this report.

About 95 percent of the commercial phosphoric acid produced by the wet process is used in the production of fertilizers and animal feed, with a small portion used as a feedstock in chemical processing operations.² Typically, the fertilizer and feed plants are co-located with the phosphoric acid facilities.

As shown in Exhibit 12-1, the majority of the 21 active wet process facilities are located in the southeast, with 12 in Florida, three in Louisiana, and one in North Carolina. Production data and dates of initial operation and modernization were provided by all 21 facilities, although two claimed confidential status for their information. The dates of initial operation for the 19 non-confidential facilities ranges from 1945 to 1986.³ Most of these facilities have undergone modernization within the last ten years, although six facilities have not been upgraded in over 20 years. The 19 reporting non-confidential facilities have a combined annual production capacity of over 11 million metric tons and a 1988 aggregate production of nearly 8.5 million metric tons; the 1988 capacity utilization rate, therefore, was approximately 77 percent. Several facilities, however, operated at low utilization rates (i.e. three facilities reported rates of 15.8, 30.1 and 37.5 percent).

The fertilizer industry, the largest user of phosphoric acid, suffered poor financial conditions for much of the 1980s. These conditions were the result of low domestic demand and reduced foreign buying. Domestic demand for phosphoric acid was boosted by the 1988 recovery of the farm economy and was expected to continue to grow as crop prices and planted acreage increased in 1989. Non-fertilizer uses of phosphoric acid declined during the 1980s due to strict regulations governing the use of phosphates in household products and a decline in industrial demand.⁴

The wet process consists of three operations: digestion, filtration, and concentration, as shown in Exhibit 12-2.⁵ Beneficiated phosphate rock is dissolved in phosphoric acid; sulfuric acid is added to this solution and chemically digests the calcium phosphate. The product of this operation is a slurry that consists

¹ At least two facilities were on standby in 1988, Agrico's Ft. Madison, lows and Hahnville (Taft), Louisians facilities; they are not included in this analysis.

² Bureau of Mines, 1987. Minerals Yearbook, 1987 Ed., p. 676.

³ Phosphoric soid producers, 1989. Company Responses to the "National Survey of Solid Wastes from Mineral Processing Facilities," U.S.EPA, 1989.

⁴ Standard & Poor's, "Chemicals: Basic Analysis," <u>Industry Surveys</u>, October 13, 1988 (Section 3), p. C20.

⁵ Environmental Protection Agency, 1986. <u>Evaluation of Waste Management for Phosphate Processing.</u> Prepared by PEI Associates for U.S. EPA, Office of Research and Development, Cincinnati, OH, August, 1986.

Exhibit 12-1
Wet Processing Phosphoric Acid Plants

Operator	Location	Perent Company
Agrico	Donaldeonville, LA	Freeport-McMoRan Res. Part.
Agrico	Mulberry (Pierce), FL	Freeport-McMoRen Res. Part.
Agrico	Uncle Sam, LA	Freeport-McMoRan Res. Part.
Arcadian	Geismer, LA	(same as operator)
Central Phos.	Plant City, FL	CF industries
CF Chemicals	Bertow (Bonnie), FL	(same as operator)
Chevron Chem.	Rock Springs, WY	Chevron Corp.
Conserv	Nichole, FL	(same as operator)
Fermiand ind.	Bertow (Pierce), Ft	(same as operator)
Fort Meade Chem.	Fort Meade, FL	US Agri-Chem and WR Grace
Gardinier	Riverview (Temps), FL	(same as operator)
IMC Fertilizer	New Wales (Mulberry), FL	(same as operator)
Mobil Mining	Pesadene, TX:	Mobili Off Corp. (Mobil Corp.)
Nu-South Ind.	Pascagouta, MS	Nu-West Industries
Nu-West	Soda Springe (Conda), 10	(seme as operator)
Occidental Chem.	White Springs, FL	Occidental Petroleum
Royeter	Mulberry, FL	Cedar Holding Co.
Royster	Palmetto (Piney Pt), FL	Ceder Holding Co.
Seminole Fest.	Bettow, FL March 1997 1997 1997 1997	(same as operator)
JR Simplot	Pocatello, ID	(same as operator)
Texasguit	Aurora, NC	(serne es operator)

of the phosphoric acid solution and a suspended solid, calcium sulfate, commonly known as phosphogypsum. The slurry is routed to a filtration operation where the suspended phosphogypsum is separated from the acid solution. The acid isolated during filtration is concentrated through evaporation to produce "merchant-grade" (54 percent) phosphoric acid. The phosphogypsum is re-slurried, this time in recycled process wastewater, so that it can be pumped to the disposal area. In addition to the large volume of phosphogypsum generated by the wet process, large volumes of process wastewaters are produced, primarily from phosphogypsum transport, phosphoric acid concentration, and process temperature control and cooling. These wastewaters are managed in impoundments and primarily recycled, although some facilities have permits to discharge wastewaters to ground water or surface water.

⁶ As discussed in detail in the preamble to the final rule that retained the exclusion from RCRA Subtitle C regulations for process wastewater (see 55 FR 2322, January 23, 1990), these are not the only sources of process wastewater. "Process wastewater from phosphoric acid production" also includes phosphogypsum stack runoff, process wastewater generated from the uranium recovery step of phosphoric acid production, process wastewater from animal feed production (including defluorination but excluding ammoniated animal feed production), and process wastewater from superphosphate production.

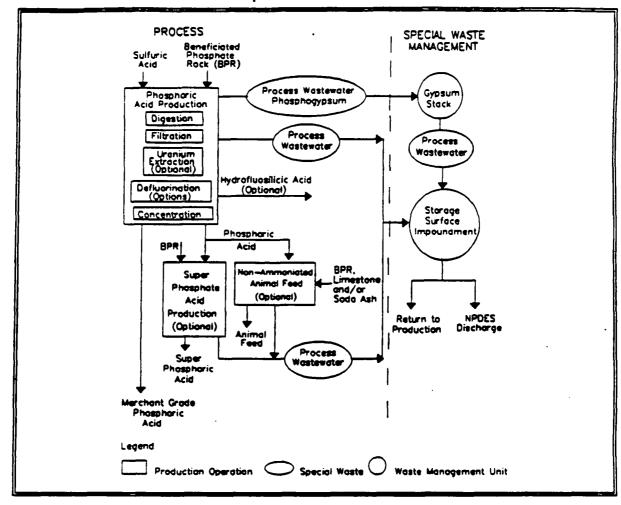


Exhibit 12-2
Phosphoric Acid Production

12.2 Waste Characteristics, Generation, and Current Management Practices

12.2.1 Phosphogypsum

Phosphogypsum, which has an average particle diameter of less than 0.02 millimeters, is primarily composed of calcium sulfate, silicon, phosphate, and fluoride. It also typically contains a variety of radionuclides, including uranium-230, uranium-234, thorium-230, radium-226, radon-222, lead-210 and polonium-210.

Using available data on the composition of phosphogypsum, EPA evaluated whether leachate from this material exhibits any of the four characteristics of hazardous waste: corrosivity, reactivity, ignitability, and extraction procedure (EP) toxicity. Based on available information and professional judgment, the Agency does not believe phosphogypsum is reactive, corrosive, or ignitable. Some phosphogypsum samples, however, exhibit the characteristic of EP toxicity. EP leach test concentrations of all eight inorganic constituents with EP toxicity regulatory levels are available for 28 phosphogypsum samples from 11 facilities of interest. Of these constituents, only chromium concentrations exceed the EP toxicity levels; this occurred in 2 of 28 samples analyzed, by as much as a factor of 9. Both samples that failed the EP toxicity criterion for chromium

were from the Rock Springs facility. The phosphogypsum samples that failed the EP toxic level were also analyzed using the SPLP leach test, and for both samples, concentrations of chromium measured by the SPLP leach test were well below the EP toxicity regulatory levels.

Non-confidential waste generation rate data were reported for phosphogypsum by 18 of the 21 processing facilities and estimated for the remaining three. The aggregate annual industry-wide generation of phosphogypsum was approximately 47.6 million metric tons in 1988, yielding a facility average of about 2.26 million metric tons per year. Reported facility generation rates ranged from .14 to 6.8 million metric tons of phosphogypsum. The sector-wide ratio of phosphogypsum to phosphoric acid ranges from 3.7 to 5.6, averaging 4.9 for the sector.

Phosphogypsum is managed in basically the same way at virtually all of the 21 active facilities. The phosphogypsum removed by the filtration step in the phosphoric acid production process is slurried in process wastewater and pumped to one or more impoundments located on the top of an on-site waste pile known in the industry as a gypsum stack. In the impoundment, the gypsum solids are allowed to settle; the liquid (process wastewater) is either directly removed from the settling pond and sent to a nearby cooling pond or indirectly removed after it seeps though the stack and is collected by ditches or ponds that circumscribe the stack.

Periodically, the phosphogypsum slurry is diverted from one impoundment on the gypsum stack to another and the first impoundment is allowed to dry. The dewatered phosphogypsum is excavated from the inactive pond and used to build up the dike that forms the impoundment and then the impoundment is returned to active service. In this manner, the stack with its series of settling ponds increases in height and accumulates additional phosphogypsum. The ultimate height and area of the resulting stack depends on the configuration of the facility's property and the ability of the native soils to support the load of the stack. After a stack is "full", rainwater that runs off or leaches through the stack continues to be collected in the perimeter ditch and is usually managed with water collected from active stacks.

The average dimensions of the gypsum stacks are 130 hectares (320 acres) at the base and 35 meters (115 feet) in height; on a facility-specific basis the stacks range from about 20 to 260 hectares and 3 to 130 meters in height. The average dimensions of the settling ponds atop these stacks are 54 hectares and 1.4 meters in depth; on a facility-specific basis the ponds range in size from 2.6 to 26 hectares and in depth from 3 to 7.6 meters.

12.2.2 Process Wastewater

Process wastewaters are generated at several points in phosphoric acid production, including phosphoric acid concentration, and phosphoric acid temperature control and cooling. These wastewaters contain significant quantities of chloride, fluoride, phosphate, and have a pH that ranges from 0.5 to 7.8.

Using available data on the composition of phosphoric acid process wastewater, EPA evaluated whether the wastewater exhibits any of the four characteristics of hazardous waste: corrosivity, reactivity, ignitability, and extraction procedure (EP) toxicity. Based on available information and professional judgment, the Agency does not believe the wastewater is reactive or ignitable. Some wastewater samples, however, exhibit the characteristics of corrosivity and EP toxicity. Measurements of pH in 42 out of 68 process wastewater samples from a total of 14 facilities indicated that the wastewater was corrosive, sometimes with pH values as low as 0.5 (the lower bound pH limit for the purpose of defining corrosive waste is 2.0). EP leach test concentrations of all eight constituents with EP toxicity regulatory levels are available for process wastewaters from 7 facilities. Of these constituents, cadmium and chromium concentrations were found to sometimes exceed the EP toxicity levels, and one sample was found to have a selenium concentration equal to the EP toxicity regulatory level. Concentrations of cadmium exceeded the EP toxic level in process wastewater samples from three facilities, Pocatello, Geismar, and Aurora. Cadmium was present at concentrations in excess of the EP toxic level in 19 out of 30 samples by as much as a factor of 8. From a total of 30 samples, chromium concentrations exceeded the EP toxicity regulatory level (by as much as a factor

of 2.7) in only 3 samples (2 of which were from the Pocatello facility and 1 from the Pascagoula facility). SPLP leach test results for phosphoric acid process wastewater samples were well below the EP toxicity regulatory levels for all constituents.

Non-confidential waste generation rate data were fully reported for process water by 12 of the 21 processing facilities and estimated for the remaining nine. The aggregate annual industry-wide generation of process water was approximately 1.77 billion metric tons (468 billion gallons) in 1988, yielding a facility average of 84 million metric tons per year (60 million gallons per day [mgd]). Reported facility annual generation rates ranged from 13 to 280 million metric tons of process wastewater (9.3 to 200 mgd). The ratio of process water managed to phosphoric acid produced ranges from 102 to 494.

The process wastewater from the stacks, along with non-transport process waters, are typically managed in on-site impoundments, commonly known as cooling ponds. These impoundments are used in conjunction with the gypsum stacks in an integrated system. Water from these ponds is reused in on-site mineral processing and other activities. The facility operators ideally seek to maintain a water balance such that no treatment and discharge of process wastewater to surface water is necessary, although some facilities are equipped to treat and discharge some wastewater during periods of high precipitation.

The average dimensions of the cooling ponds are nearly 60 hectares (145 acres) of surface area and 2.6 meters (8.5 feet) of depth; on a facility-specific basis the surface area ranges from 1 to 260 hectares (2.5 to 640 acres) and depth ranges from 0.3 to 6.7 meters (1 to 21 feet).

12.3 Potential and Documented Danger to Human Health and The Environment

This section addresses two of the study factors required by \$8002(p) of RCRA: (1) potential danger (i.e., risk) to human health and the environment; and (2) documented cases in which danger to human health or the environment has been proven. The Agency's evaluation of the potential dangers posed by phosphogypsum and phosphoric acid process wastewater uses the evidence presented in numerous documented cases of danger to human health and the environment to establish that these wastes can threaten human health and the environment as they are currently managed. Overall conclusions about the hazards associated with phosphogypsum and phosphoric acid process wastewater are provided after these two study factors are discussed.

12.3.1 Risks Associated With Phosphogypsum and Phosphoric Acid Process Wastewater

Any potential danger to human health and the environment from phosphogypsum and phosphoric acid process wastewater depends on the presence of toxic and radioactive constituents in the wastes that may present a hazard and the potential for exposure to these constituents. The Agency has documented cases of dangers posed by these wastes via ground and surface water pathways (see Section 12.3.2), and has previously evaluated potential air pathway dangers from the management of phosphogypsum in stacks. Based on the insights provided by analyses of the hazards posed by phosphogypsum and phosphoric acid wastewater, and information on waste characteristics and management developed for this study, the Agency evaluated the intrinsic hazard of these wastes and the potential for toxic and radioactive constituents from these wastes to pose threats to human health and the environment. This evaluation discusses constituents of potential concern in the wastes and assesses the management practice and environmental setting characteristics that affect the potential for these wastes to pose risks through the ground-water, surface water, and air pathways.

Phosphogypsum Constituents of Potential Concern

EPA identified chemical constituents in phosphogypsum that may present a hazard by collecting data on the composition of this waste and evaluating the intrinsic hazard of the chemical constituents.

Data on Phosphogypsum

EPA's characterization of phosphogypsum and its leachate is based on data from three sources: (1) a 1989 sampling and analysis effort by EPA's Office of Solid Waste (OSW); (2) industry responses to a RCRA §3007 request; and (3) sampling and analysis conducted by EPA's Office of Research and Development (ORD) in 1986. These data provide information on the concentrations of 21 metals, radium-226, thorium-232, uranium-238, gross alpha and beta radiation, a number of other inorganic constituents (i.e., phosphate, phosphorus, fluoride, chloride, sulfate, ammonia, and nitrate), and five organic constituents in total and leach test analyses. Thirteen of the 21 phosphoric acid production facilities are represented by these data.

Concentrations of most (i.e., 21 of 38) constituents in solid samples of phosphogypsum vary considerably among the samples analyzed (i.e., the range of values spans more than three orders of magnitude). Concentration data provided by industry represent a larger number of samples and span a wider range of values than do data from EPA's sampling and analysis efforts. EPA sampling and analysis data for some constituents (i.e., arsenic, selenium, silver, and thallium) do not contribute to the characterization of phosphogypsum because the detection limits used in analyzing these samples are higher than any detected concentrations from analyses of other samples.

Concentrations of most constituents in leach test analyses of phosphogypsum vary considerably less than do concentrations in solid samples (i.e., the ranges of values span less than two orders of magnitude). However, concentrations of chromium, copper, iron, lead, and zinc in EP leach test analyses vary over three or more orders of magnitude. Concentrations from analyses using the EP leach test method are consistently higher than from SPLP method analyses.

Process for Identifying Constituents of Potential Concern

As discussed in Chapter 2, the Agency evaluated the waste composition data summarized above to determine if phosphogypsum contains any chemical constituents that could pose an intrinsic hazard. The Agency performed this evaluation by first comparing the concentration of chemical constituents to screening criteria that reflect the potential for hazards, and then by evaluating the environmental persistence and mobility of constituents that are present at levels above the criteria. These screening criteria were developed using assumed scenarios that are likely to overestimate the extent to which constituents in phosphogypsum are released to the environment and migrate to possible exposure points. As a result, this process eliminates from further consideration only those constituents that clearly do not pose a risk.

The Agency used three categories of screening criteria that reflect the potential for hazards to human health, aquatic ecosystems, and air and surface/ground water resources (see Exhibit 2-3). Given the conservative (i.e., protective) nature of these screening criteria, contaminant concentrations in excess of the criteria should not, in isolation, be interpreted as proof of hazard. Instead, exceedances of the criteria indicate the need to evaluate the potential hazards of the waste in greater detail.

Identified Constituents of Potential Concern

Exhibits 12-3 and 12-4 present the results of the comparisons for phosphogypsum solid analyses and leach test analyses, respectively, to the screening criteria described above. These exhibits list all constituents for which at least one sample concentration exceeds a relevant screening criterion.

Of the 38 constituents analyzed in total analyses of phosphogypsum, only radium-226, uranium-238, chromium, and arsenic are present at concentrations exceeding the screening criteria (Exhibit 12-3). Maximum concentrations of these constituents are at most seven times the screening criteria. The sample concentrations of the first three of these constituents (i.e., all except arsenic) exceed screening criteria in at least half of the

	Exhibit 12-3		
Potential Constituents of	Concern in P	hosphogypsum	Solids ^(a)

Potential Constituents of Concern	No. of Times Constituent Detected/No. of Analyses for Constituent	Human Health Screening Criteria ^(b)	No. of Analyses Exceeding Criteria/ No. of Analyses for Constituent	No. of Facilities Exceeding Criteria/ No. of Facilities Analyzed for Constituent
Redium-226	29 / 29	Redistion*(4)	26 / 29	6/7
Uranium-238	18 / 18	Rediction*(C)	1 / 18	1/3
Chromium	34 / 43	inhalation	8 / 43	4/8
Arsenic	35 / 43	Ingestion Inhabition	34 / 43 29 / 43	2/8 1/8

- (a) Constituents listed in this table are present in at least one sample from at least one facility at a concentration that exceeds a relevant screening criterion. The conservative screening criteria used in this analysis are listed in Exhibit 2-3. Constituents that were not detected in a given sample were assumed not to be present in the sample.
- (b) Human health ecreening criteria are based on exposure via incidental ingestion and inhalation. Human health effects include cancer risk and noncancer health effects. Screening criteria noted with an *** are based on a 1x10** lifetime cancer risk; others are based on noncancer effects.
- (c) Includes direct radiation from contaminated land and inhalation of radon decay products.

facilities analyzed. None of these constituents, however, exceed the screening criteria by more than a factor of 10.

- Radium-226, and uranium-238 concentrations exceed health-based screening criteria
 based on multiple radiation pathways. Exceedance of these criteria indicates that
 phosphogypsum could pose an unacceptable radiation risk if used in an unrestricted
 manner (for instance, direct radiation doses and doses from the inhalation of radon
 could be unacceptably high if phosphogypsum is used around homes).
- Chromium and arsenic concentrations exceed the health-based screening criteria for inhalation. This indicates that these constituents could pose a significant cancer risk (i.e., greater than 1x10⁻⁵) if phosphogypsum were released to the ambient air as particles.
- Arsenic concentrations exceed the health-based screening criteria for incidental ingestion. This indicates that arsenic may pose a significant incremental lifetime health risk (i.e., greater than 1x10⁻⁵) if a small quantity of phosphogypsum or soil contaminated with phosphogypsum is inadvertently ingested on a routine basis (e.g., airborne waste particles may be deposited on crops, or small children playing on abandoned stacks could inadvertently ingest the waste).

EPA sampling and analysis also indicates that levels of gross alpha and beta radiation from phosphogypsum are very high (10 to 100 pCi/g) relative to levels associated with typical soils (approximately 1 pCi/g).

Based on a comparison of leach test concentrations of 29 constituents to surface and ground-water pathways screening criteria (see Exhibit 12-4), 17 constituents were found to be of potential concern for water-based release and exposure. Among these 17 constituents, phosphorus, arsenic, lead, phosphate, manganese, molybdenum, and nickel exceed screening criteria in at least one-half of all facilities analyzed. Twelve constituents exceed the screening criteria by more than a factor of 10, but only chromium was measured in concentrations that exceed the EP toxicity regulatory level. All of these constituents are very persistent in the environment.

Exhibit 12-4
Potential Constituents of Concern in Phosphogypsum Leachate (a)

Potential Constituents of Concern	No. of Times Constituent Detected/No. of Analyses for Constituent	Screening Criteria ^(b)	No. of Analyses Exceeding Criteria/ No. of Analyses for Constituent	No. of Facilities. Exceeding Criteria/ No. of Facilities Analyzed for Constituent
Phosphorus	17 / 17	Aquatic Ecological	17 / 17	9/9
Arsenic	19 / 28	Human Health	19 / 28	10 / 11
Lead	14 / 26	Human Health Resource Damage Aquatic Ecological	4 / 28 12 / 28 2 / 28	3/11 7/11 2/11
Phosphate	19 / 19	Aquatic Ecological	19/19	9/9-
Manganese	21 / 22	Resource Damage	9/22	6/11
Molybdenum	16 / 20	Resource Damage	10 / 22	6 / 10
Nickel	19/22	Resource Damage Aquatic Ecological	198400124 2 / 92 44 (144) 1984 - 249 10720 9	2/11 6/11
iron	20 / 20	Resource Damage Aquatic Ecological	6 / 20 1 / 20	4 / 10 1 / 10
Cedmium	26 / 38 (455-4 166 5	Human Health Resource Damage Aquetic Ecological		3/11 4/11 4/11
Chromium	27 / 28	Human Health Resource Damage Aquatic Ecological	2 / 26 5 / 26 4 / 26	1/11 3/11 2/11
Silver	14/28	Aquatic Ecological	6/26	3 / 10
Fluoride	17 / 17	Human Health	3 / 17	2/9
Zinc	.21:/22:3~~	Human Health	1/2	1/11 1/11 2/11
Antimony	5/22	Human Health	3/22	2/11
Copper	19/52	Human Health Researce Damage Aquatic Sociegical	1 / 122 1 / 122 4 / 123	1/11 == // 1/11 == // 2/11
Mercury	3 / 24	Aquatic Ecological	1/24	1 / 10
Thellium	V - Germania 1 / 20 1228-1259	Human Health	v tere " e. j. 1./20 te	1 / 10

⁽a) Constituents listed in this table are present in at least one earnple from at least one facility at a concentration that exceeds a relevant acreening criterion. The conservative acreening criteria used in this analysis are listed in Exhibit 2-3. Constituents that were not detected in a given earnple were assumed not to be present in the earnple. The constituent concentrations used for this analysis are based on EP leach test results.

⁽b) Human health screening criteria are based on cancer risk or noncencer health effects. "Human health" screening criteria noted with an ** are based on 1x10⁻⁸ Metime cancer risk; others are based on noncencer effects.

These exceedances of the screening criteria have the following implications:

- Concentrations of arsenic, lead, cadmium, chromium, fluoride, zinc, antimony, copper, and thallium in phosphogypsum leachate exceed screening criteria based on human health risks. This indicates that, if phosphogypsum leachate were diluted less than 10-fold during migration to a drinking water exposure point, long-term chronic ingestion could cause adverse health effects due to the presence of these constituents. The concentration of arsenic in diluted phosphogypsum leachate could pose a cancer risk of greater than 1x10⁻⁵ from long-term drinking water exposures.
- Concentrations of phosphorus, lead, phosphate, nickel, iron, cadmium, chromium, silver,
 zinc, copper, and mercury in phosphogypsum leachate exceed screening criteria for protection of aquatic life. This means that phosphogypsum leachate could present a threat to aquatic organisms if it migrates (with less than 100-fold dilution) to surface waters.
- Lead, manganese, molybdenum, nickel, iron, cadmium, chromium, zinc, and copper
 concentrations in phosphogypsum leachate exceed ground and surface water resource
 damage screening criteria. This indicates that, if released and diluted by a factor of 10
 or less, leachate from this waste may contain these constituents in concentrations
 sufficient to severely restrict the potential future uses of nearby ground and surface
 water resources.

These exceedances of the screening criteria, by themselves, do not demonstrate that phosphogypsum poses a significant risk, but rather indicate that it may present a hazard. To determine the potential for phosphogypsum to cause significant impacts, EPA proceeded to analyze the actual conditions that exist at the facilities that generate and manage the waste (see the following section on release, transport, and exposure potential).

Process Wastewater Constituents of Potential Concern

Using the same process summarized above for phosphogypsum, EPA identified chemical constituents in phosphoric acid process wastewater that could conceivably pose a risk by collecting data on the composition of this waste, and evaluating the intrinsic hazard of the chemical constituents present in the process wastewater.

Data on Process Westewater Composition

EPA's characterization of process wastewater and its leachate is based on data from: (1) a 1989 sampling and analysis effort by EPA's Office of Solid Waste (OSW), and (2) industry responses to a RCRA §3007 request. These data provide information on the concentrations of 21 metals, radium-226, uranium-238, gross alpha and gross beta radiation, a number of other inorganic species (i.e., chloride, fluoride, phosphate, nitrate, sulfate, and ammonia), and seven organic compounds in total and leach test analyses. Data on the pH of process wastewater was also collected: at most facilities, the pH is between 1 and 2 standard units, however, two facilities report minimum levels below 1, and 1 facility reports levels between 6.5 and 8 standard units. The waste composition data represent samples collected from 17 of the 21 active phosphoric acid production facilities. As with the concentration data for phosphogypsum, data on the concentrations of most constituents in process wastewater vary over two or three orders of magnitude. Concentrations from leach test analyses of the wastewater vary to a smaller extent.

Concentrations of most (i.e., 22 of 40) constituents in total analyses of process wastewater vary considerably among the samples analyzed (i.e., the range of values spans more than three orders of magnitude). Concentration data provided by industry represent a larger number of samples and span a wider range of values than do data from EPA's sampling and analysis efforts. Concentrations of most constituents in leach test analyses of process wastewater vary considerably less than do concentrations in total analyses (i.e., the ranges of values span two or three orders of magnitude for only five constituents). Because the waste

characterization provided by total analyses and leach test analyses are similar, and because the quantity of data is much greater for total analyses, the following analysis of potential constituents of concern in process wastewater is based on the results of total analyses only.

Identified Constituents of Potential Concern

Exhibit 12-5 presents the results of the comparisons for the phosphoric acid process wastewater total analyses to the screening criteria described above. This exhibit lists all constituents for which at least one sample concentration exceeds a relevant screening criterion.

Of the 40 constituents analyzed in process wastewater (and its leachate), levels of arsenic, phosphorus, phosphate, cadmium, chromium, aluminum, gross alpha and beta radiation, radium-226, phenol, iron, manganese, nickel, lead, vanadium, sulfate, copper, boron, molybdenum, antimony, thallium, silver, cobalt, mercury, fluoride, zinc, chloride, beryllium, selenium, and pH exceed the Agency's screening criteria. All of these constituents are metals or other inorganics that do not degrade in the environment.

The first 22 of these 30 constituents are of relatively greater potential concern because their concentrations in samples from at least one-half of all facilities analyzed exceed screening criteria (based on separate evaluations of total liquid and leach test results). Maximum concentrations of phosphorus, phosphate, arsenic, and phenol exceed screening criteria by factors of greater than 1,000 and concentrations of 15 other constituents exceed screening criteria by factors of at least 10. As discussed in Section 12.2, cadmium, chromium, and selenium concentrations are occasionally greater than or equal to the EP toxicity regulatory levels, and the pH is frequently below 2.0, the lower-bound limit for defining a corrosive waste.

These exceedances of the screening criteria indicate the potential for the following types of impacts under the following conditions:

- Concentrations of arsenic, cadmium, chromium, radium-226, lead, vanadium, copper, antimony, thallium, fluoride, and selenium in process wastewater exceed screening criteria based on human health risks. This indicates that, if process wastewater was diluted 10-fold during migration to a drinking water exposure point, long-term exposures could cause adverse health effects due to the presence of these constituents. Based on long-term drinking water exposures, arsenic concentrations could pose a significant cancer threat (i.e., a lifetime risk of greater than 1x10⁻⁵).
- Concentrations of arsenic, cadmium, chromium, aluminum, gross alpha and beta radiation, radium-226, phenol, iron, manganese, nickel, lead, vanadium, sulfate, copper, boron, molybdenum, cobalt, silver, fluoride, chloride, beryllium, and selenium in process wastewater exceed ground and surface water resource damage screening criteria. This indicates that, if released and diluted less than 10-fold in ground water or less than 100-fold in surface water, phosphoric acid process wastewater may contain these constituents in concentrations sufficient to severely restrict the uses of nearby ground- and surface water resources. In addition, the pH of phosphoric acid plant process wastewater is very low, and water resources may be damaged by the highly acidic nature of this waste.
- Concentrations of arsenic, phosphorus, phosphate, cadmium, chromium, aluminum, iron, nickel, lead, copper, silver, mercury, zinc, and selenium in process wastewater exceed screening criteria based on aquatic life protection. The low pH of the wastewater is also well below the levels that most aquatic life can tolerate. This means that phosphoric acid plant process wastewater may present a threat to aquatic organisms if it migrates (with 100-fold dilution) to surface waters.

These exceedances, by themselves, do not prove that the wastewater poses a significant risk, but rather indicate that it may present a hazard under a very conservative, hypothetical set of release, transport, and exposure conditions. To determine the potential for this waste to cause significant impacts, EPA proceeded to the next step of the risk assessment to analyze the actual conditions that exist at the facilities that generate and manage the wastewater.

Exhibit 12-5
Potential Constituents of Concern in Phosphoric Acid Process Wastewater (Total) (a)

Potential Constituents of Concern	No. of Times Constituent Detected/No. of Analyses for Constituent	Screening Criteria ^(b)	No. of Analyses Exceeding Criteria/ No. of Analyses for Constituent	No. of Facilities Exceeding Criteria/ No. of Facilities Analyzed for Constituent
Arsenic	77 [78	Human Health' Resource Damage Aquetic Ecological	76 / 78 37 / 78 21 / 78	15 / 15 8 / 15 5 / 15
Phosphorus	31 / 31	Aquatic Ecological	31 / 31	10 / 10
Phosphate	38 / 38	Aquatic Ecological	38 / 38	9/9
Cadmium	73 / 77	Human Health Resource Damage Aquatic Ecological	65 / 77 69 / 77 68 / 77	14 / 15 14 / 15 14 / 15
Chromium	75 / 76	Human Health Pasource Damage Aquatic Ecological	26 / 76 65 / 78 44 / 78	8/15 14/15 9/15
Aluminum	58 / 59	Resource Demage Aquatic Ecological	42 / 50 53 / 50	8 / 10 10 / 10
Gross Alpha	46 / 47	Resource Demage	40 / 47	11 / 11
Gross Beta	34 / 47	Resource Demage	30 / 47	9/9
Redium-226	86 / 80	Human Health Resource Demage	26 / 89 14 / 89	9 / 13 6 / 13
Phenol	4/5	Resource Damage	4/5	3/3
Iron	64 / 56	Resource Demage Aquatic Ecological	52 / 55 53 / 55	10 / 10 6 / 10
Manganese	44 / 44	Recourse Damage	41 / 44	10 / 10
Nickel	66/78 (%/7)	Resource Damage :	14 / 72 57 / 72	8 / 14. 12 / 14
Load	64 / 75	Human Health Resource Damage Aquatic Ecological	28 / 75 51 / 75 22 / 75	8/15 12/15 7/15
Venedium		Homen Health Percurse Damage	18 /41	::::::::::::::::::::::::::::::::::::::
Sulfate	57 / 57	Resource Damage	43 / 57	10 / 11
Copper 1 Hard Life	ver (1 € / 74 ° 1) 	Human Health Resource Damage Aquatic Ecological	1 / 74 10	1 / 14 / 20 1 / 1 / 14 1 / 1 / 14 1 / 14

⁽a) Constituents listed in this table are present in at least one sample from at least one facility at a concentration that exceeds a relevant screening oritarion. The conservative screening criteria used in this analysis are listed in Exhibit 2-3. Constituents that were not detected in a given earnple were assumed not to be present in the earnple.

⁽b) Human health acreening criteria are based on cancer risk or noncensor health effects. "Human health' screening criteria noted with an ** are based on 1x10⁻⁶ lifetime cancer risk; others are based on noncensor effects.

12-12

Exhibit 12-5 (cont'd)
Potential Constituents of Concern in Phosphoric Acid Process Wastewater (Total) (a)

Potential Constituents of Concern	No. of Times Constituent Detected/No. of Analyses for Constituent	Screening Criteria ^(b)	No. of Analyses Exceeding Criteria/ No. of Analyses for Constituent	No. of Facilities Exceeding Criteria/ No. of Facilities Analyzed for Constituent
Boron	2/2	Resource Damage	1/2	1/1
Molybdenum	34 / 39	Resource Damage	27 / 39	10 / 10
Antimony	27 / 70	Human Health	10 / 70	6/14
Thellium	18 / 56	Human Health	18 / 56	5 / 13
Cobelt	35 / 41	Resource Damage	7 / 41	3 / 10
Silver	43 / 73	Aquatic Ecological	12 / 73	5/14
Mercury	45 / 74	Aquetic Ecological	6 / 74	4/14
Fluoride	53 / 53	Human Health Resource Damage	3 / 53 1 / 53	1 / 12 1 / 12
Zinc	77 77	Aquetic Ecological	9/77	3/14
Chloride	26 / 26	Resource Damage	2 / 25	1/6
Beryllium	66 / 71	Resource Damage	2/71	1/14
Selenium	56 / 73	Human Health Resource Damage Aquatic Ecological	1 / 73 2 / 78 2 / 73	1 / 14 1 / 14 1 / 14
pH ·	66 / 68	Resource Demage	59 / 68	13 / 14

⁽a) Constituents listed in this table are present in at least one sample from at least one facility at a concentration that exceeds a relevant screening criterion. The conservative acreening criteria used in this analysis are listed in Exhibit 2-3. Constituents that were not detected in a given sample were assumed not to be present in the sample.

Release, Transport, and Exposure Potential

This analysis evaluates the baseline hazards of phosphogypsum and phosphoric acid plant process wastewater as it was generated and managed at the 21 phosphoric acid facilities in 1988. It does not assess the hazards of off-site use or disposal of these wastes or the risks associated with variations in waste management practices or potentially exposed populations in the future because of a lack of data on off-site and projected future conditions.

EPA has identified a variety of documented cases of dangers posed by the release of constituents from these wastes to the environment, and EPA's Office of Air and Radiation (OAR) has studied air pathway risks (from radionuclides) posed by these wastes. Consequently, the Agency has used information on documented and potential damages from these other analyses to support its evaluation of the release, transport, and exposure potential of the current management of these wastes.

⁽b) Human health screening criteria are based on cancer risk or noncancer health effects. "Human health" screening criteria noted with an *** are based on 1x10** Siletime cancer risk; others are based on noncancer effects.

Ground-Water Release, Transport, and Exposure Potential

Section 12.3.2 describes documented cases of ground-water contamination at seven phosphoric acid plants located in Central Florida (3), Louisiana (2), North Carolina (1), and Idaho (1). These cases indicate that phosphogypsum and process wastewater constituents have been released to ground water at a number of facilities and, at some sites, have migrated off-site to potable wells in concentrations that are well above hazard criteria. Based on the analysis of the damage case evidence, presented below, EPA concludes that management of phosphogypsum and process wastewater in stacks and ponds can release contaminants to the subsurface, and depending on the hydrogeologic setting and ground-water use patterns, threaten human health via drinking water exposures or render ground-water resources unsuitable for potential use.

In the following paragraphs, EPA presents a region-by-region assessment of the hazards posed by phosphogypsum and process wastewater management. For purposes of this discussion, phosphoric acid plants are grouped into the following eight regions: Central Florida, North Carolina, Louisiana, Idaho, North Florida, Mississippi, Texas, and Wyoming. For each region for which ground-water damages have been documented, the Agency first builds the case that damages attributable to waste management have occurred, then, to the extent necessary, uses environmental setting information to assess the potential hazards (i.e., health risks and resource damage potential) at other facilities in the region. When no damage case information is available for a region, evidence of release potential is used in conjunction with environmental setting information to assess the hazards of potential releases from the plants in these regions.

Central Florida. The Florida Department of Environmental Regulation has initiated enforcement actions in response to ground-water contamination associated with the management of phosphogypsum and process wastewater at all 11 active phosphoric acid production facilities in Central Florida. At three of these facilities (i.e., Central Phosphates, Seminole, and IMC) contamination of the useable intermediate or Floridan aquifers exceeds primary drinking water standards for pH, gross alpha radiation, radium, sodium, total dissolved solids, sulfate, cadmium, chromium, fluoride, and arsenic beyond the permitted zone of discharge. With the exception of sodium and total dissolved solids, all of these constituents were identified as potential constituents of concern in phosphogypsum or process wastewater. At the other eight facilities, contamination exceeding drinking water standards beyond the permitted zone of discharge has been detected only in the surficial aquifer. Two of the three damage cases for Central Florida phosphoric acid production plants presented in Section 12.3.2 (i.e., Central Phosphates and Seminole) discuss contamination of off-site ground water in formations that are used for water supplies. At Central Phosphates, a ground-water contamination plume in the Floridan aquifer extends six acres beyond the facility boundary; contamination of the surficial aquifer covers 28 acres outside the facility boundary. Twelve of 18 potable supply wells down-gradient of the Seminole plant sampled in 1988 contained at least one constituent at a concentration in excess of a drinking water standard. The owner of the phosphoric acid plant paid to have the affected properties connected to a public water supply. These ground-water contamination incidents indicate a high potential for ground-water releases from the phosphoric acid production plants in Central Florida. Except for the Gardinier facility, all operating plants in this area are within 1,000 meters of a public supply well and contamination of the Floridan aquifer at these sites could pose a public health threat via drinking water exposures. As demonstrated by the damage cases and violations of drinking water standards beyond the permitted zone of discharge, contaminants from these wastes can reach the useable aquifer in this area and migrate down-gradient toward potential exposure points.

North Carolina. Section 12.3.2 discusses ground-water contamination resulting from management of process wastewater at the phosphoric acid plant in Aurora, North Carolina. The extent of ground-water contamination at this site is not known with certainty, but fluoride and total dissolved solids concentrations in on-site wells exceed state drinking water standards in the surficial aquifer that is not extensively used and

⁷ The State of Florida allows discharges to ground water within a defined "zone of discharge." The horizontal extent of the zone sypically is limited to the property boundary.

in an intermediate aquifer that is useable, but not developed in the vicinity of the site. No contamination has been detected in a deeper aquifer that serves as the principal water supply in this area. Although off-site migration of contaminants and contamination of the principal water supply aquifer have not been documented, exposures could occur if contaminated drinking water were withdrawn from the surficial aquifer at nearby residences (as close as 100 meters). Even though ground water in the surficial and intermediate aquifers is not currently used as a drinking water source, the documented contamination may render ground water beneath the facility, and possibly down-gradient of the facility, unsuitable for potential future uses.

Louisiana. Documented cases of ground-water damages from phosphogypsum and process wastewater management at two plants in Louisiana are presented in Section 12.3.2. Data provided in the damage cases indicates that ground water beneath the Geismar facility is contaminated with gross alpha radiation at concentrations more than six times the federal primary drinking water standard. In addition, the Louisiana Department of Environmental Quality concluded in 1986 that "contamination of the shallow ground water [at Donaldsonville], although by constituents which are not of great concern, poses a threat to drinking water. B Current human health threats via drinking water at the Donaldsonville and Geismar facilities are unlikely because there are no private residences or public wells that derive drinking water supplies within 1,600 meters (1 mile) down-gradient of these facilities. However, ground-water releases are also likely at the third active Louisiana plant (Uncle Sam), and potential exposures to contaminated ground water could occur at a residence located 180 meters down-gradient from this facility.

Idaho. One of the two phosphoric acid plants in Idaho is discussed in a damage case in Section 12.3.2. Although this damage case does not provide conclusive evidence of long-term ground-water contamination from releases of phosphogypsum and process wastewater, data presented indicate that a few constituents of concern for these wastes (e.g., selenium, manganese, sulfate, and phosphate) may be contaminating ground water down-gradient of the Caribou facility. Because of relatively high levels of background contamination, a recent geophysical survey at Caribou did not delineate a ground-water contamination plume originating at the plant. Nevertheless, selenium concentrations exceed federal secondary drinking water standards at on-site and down-gradient off-site production wells, and phosphate concentrations at a down-gradient off-site production well exceed background levels by a factor of 170. Both of these constituents are found in process wastewater, and a recent EPA site inspection report concludes that the ground-water monitoring data "suggest that some leakage from the [process wastewater] cooling pond may be occurring presently. 9 In addition to this evidence of continuing contamination of the useable aquifer, the Caribou damage case discusses a spill of process wastewater, resulting from a dike failure, that contaminated off-site ground water with cadmium (at a concentration more than four times the federal drinking water standard), phosphate, and fluoride. Consequently, EPA concludes that typical management of phosphogypsum and process wastewater in Idaho may allow the continuous seepage of contaminants to ground water, and mismanagement (i.e., spills) of process wastewater has caused ground-water contamination. Any ground-water contamination that does occur as a result of waste management at the two Idaho facilities could pose human health threats at residences located 240 and 850 meters down-gradient of the Carlbou and Pocatello plants, respectively.

North Florida and Mississippi. Although not demonstrated in the documented damage cases, ground-water contamination potential also appears to be relatively high at the plants in North Florida and Mississippi. As with the Central Florida facilities, the White Springs facility in North Florida is in karst terrane (characterized by sinkholes and underground cavities developed by the dissolution of carbonate rock such as limestone) which creates the potential for contaminant transport with limited dilution. Releases at

⁸ Louisisms Department of Environmental Quality. 1986. Letter from George H. Cramer, II, Administrator to Susan Stewart, Agrico Manager Energy and Environmental Control, Re: Hydrogeologic Assessment, Final Report GD-093-0791.

PA Region 10. 1988. Site Inspection Report to Nu-West Industries. Conds Plant, Caribou, Idaho. TDD F10-6702-08.

this plant could result in exposures at a residence located 180 meters down-gradient. Ground-water contamination potential appears high at the Pascagoula plant in Mississippi because ground water occurs at a depth of only 1.5 meters in this area. Human populations are not likely to be exposed to potential ground-water contaminants at this facility, however, because currently there are no residences or public supply wells within 1,600 meters down-gradient from the facility.

Texas and Wyoming. The potential for ground-water pathway risks at the Texas and Wyoming facilities is relatively low. Releases from the management units at the plant in Pasadena, Texas are limited to some extent because the stack at this facility is lined with recompacted local clay, and exposures to existing populations are unlikely because there is no residence or public supply well within 1,600 meters down-gradient from the facility. Similarly, the facility in Rock Springs, Wyoming poses a relatively low risk because its stack has a synthetic liner and the nearest down-gradient residence is quite distant (greater than 1,600 meters).

Surface Water Release, Transport, and Exposure Potential

The potential for the release of contaminants from phosphogypsum stacks and process wastewater ponds to surface water is also demonstrated by the damage cases presented in Section 12.3.2. These cases indicate that phosphogypsum and process wastewater management at plants in Central Florida, North Carolina, and Louisiana has resulted in the release of waste constituents to surface waters. Based on the analysis of the damage case evidence, it is clear that management of phosphogypsum and process wastewater in stacks and ponds can, and does, release contaminants to nearby surface waters. Depending on the distance to surface waters, the hydrogeologic setting, and surface water use patterns, EPA concludes that there is a potential for these released contaminants to migrate off-site and threaten human health via drinking water exposures, threaten aquatic life, or render surface water resources unsuitable for potential consumptive uses.

In the following paragraphs, EPA presents a region-by-region assessment of the hazards to surface water quality posed by phosphogypsum and process wastewater management. For each region for which surface water releases have been documented, the Agency first builds the case that releases from waste management units have occurred in the past and are typical of current practices, then uses environmental setting information to assess the potential hazards (i.e., health risks, risk to aquatic organisms, and resource damage potential) at other facilities in the region. When no damage case information is available for a region, evidence of release potential is used in conjunction with environmental setting information to assess the hazards of potential releases from the plants in these regions.

Central Florida. The damage cases presented in Section 12.3.2 indicate that unpermitted discharges of process wastewater and/or phosphogypsum stack seepage to surface waters have occurred at the Gardinier and Seminole plants in Central Florida. At the Gardinier facility, a number of releases from 1984 to 1988 have been documented. Releases to surface water from solid waste management at this plant arise from the discharge of untreated stack seepage from a drain system that is designed to intercept and collect leachate and effluent flowing laterally away from the stack. As indicated in the damage cases, fluorides, phosphorus, and radioactive substances are present at concentrations of concern in the effluent from this drain system. In addition, these unpermitted discharges had a pH of 1.5 to 2.2. In 1988, county and state inspectors discovered damaged vegetation on the shoreline of Hillsborough Bay along the west side of the gypsum stack where an unpermitted discharge was occurring. The affected area — approximately one-half acre of saltwater marshes and wax myrtle — had turned a brownish color, ¹⁰ presumably as a result of the discharge of untreated stack seepage. At the Seminole facility, surface water contamination has occurred via an unpermitted discharge to Bear Branch. Similar releases, or releases of contaminated ground-water discharging to surface water, could also occur at the eight other facilities in this area that are located near surface waters. At two of these

¹⁶ Hillsborough County Environmental Protection Commission. October 6, 1988. Memorandum from Roger Stewart, Director. to Pam Jorio. Commissioner.

facilities (i.e., Central Phosphates and IMC), the nearby river is used as a source of drinking water downstream of the facility and releases to these rivers could pose a human health threat via drinking water exposures. Of the 11 active Central Florida plants, only Royster/Mulberry is not within 1,000 meters of surface water and is unlikely to pose a threat to surface water resources.

North Carolina. As at the Gardinier plant, unpermitted discharges of stack drainage and process wastewater from the plant in Aurora, North Carolina are also associated with failure of the drain system designed to collect seepage at the foot of the gypsum stacks. In two separate incidents in 1980 and one in 1987, concentrations of fluoride and phosphorus released from the plant exceeded permit limits as a result of drainage ditch and dike failure and drain overflow. In the 1987 episode, the pH of a freshwater canal was below 6.0 for two hours and 18 dead fish were discovered in the week following the release. Based on this evidence, the Agency concludes that episodic releases from the phosphogypsum stack and ponds at this facility were not adequately controlled by run-on/run-off controls and collection of stack seepage. In addition, contaminants released to ground water may discharge to the Pamlico River and to the creeks in the vicinity of the site where they may endanger aquatic life.

Louisiana. Two documented cases of surface water damages from phosphogypsum and process wastewater management in Louisiana are presented in Section 12.3.2. At both the Donaldsonville and Geismar plants, releases occurred as a result of the emergency discharge of untreated water from gypsum stacks and ponds to surface waters. As noted in the damage cases, the facility operators claimed that these discharges were necessitated by excess precipitation that threatened to cause stack failures. Emergency discharges are permitted at facilities on the lower Mississippi during periods of excess precipitation. As discussed above, ground-water contamination potential is also significant at the three facilities in Louisiana, and ground water discharging to surface waters may provide another means of contaminant release. The threats posed by releases to surface waters in Louisiana may be limited somewhat by the large flow of the Mississippi River. Because the Mississippi River is not used as a source of drinking water directly downstream of the three phosphoric plants, releases from these plants do not pose any current human health threats.

Based on the evidence presented above, EPA concludes that constituents of phosphogypsum and process wastewater that are managed near surface water bodies are likely to be released to nearby surface waters as a result of stack failures, drain failure, and possibly ground-water seepage. The facilities in Pasadena, Texas; Pascagoula, Mississippi; and White Springs, Florida (north) are located close to surface waters and receive relatively large quantities of precipitation. Consequently, these plants may present a hazard to surface water similar to that of the Louisiana and Central Florida facilities. The surface water contamination potential at the plant in Pocatello, Idaho is somewhat lower because the small amount of precipitation limits ground-water recharge and the possibility of stack failure due to excess precipitation, but contamination of the Portneuf River (located only 240 meters away) may occur. Surface water contamination is unlikely at the plants in Rock Springs, Wyoming and Carlbou, Idaho because of the relatively small amounts of annual precipitation (i.e., 20 to 35 cm/year) and the large distances to the nearest surface water (370 to 2,600 meters).

Air Release, Transport, and Exposure Potential

Air pathway hazards associated with phosphogypsum and process wastewater relate primarily to the emission of radon gas from the radioactive decay of radium found in these wastes and the emission of particulate matter resulting from the disturbance of the phosphogypsum stack surface.

In support of a rulemaking on national emission standards for radionuclides, EPA's Office of Air and Radiation (OAR) has assessed the risks of radon emissions from phosphogypsum stacks.¹¹ In this risk

¹¹ U.S. EPA, 1989, Risk Assentants: Environmental Impact Statement for NESHAPS Redistraction, Volume 2 (Background Information Document), Office of Radiation Programs.

assessment, OAR estimates that the lifetime cancer risk to the maximally exposed individual (MEI) caused by the inhalation of radon in the vicinity of a phosphogypsum stack is $9x10^{-5}$. The MEI lifetime cancer risk from radon inhalation is greater than or equal to $1x10^{-5}$ at 17 of the 21 active phosphoric acid facilities. Only the plants in Pascagoula, Mississippi; Aurora, North Carolina; Rock Springs, Wyoming; and White Springs, Florida have an estimated MEI lifetime cancer risk from radon inhalation of less than $1x10^{-5}$.

Because phosphogypsum forms a crust on inactive areas of the stack as it dries, and because the active areas of the stack are moist, the emission of particulate matter by wind erosion is not thought to be a significant release mechanism. Physical disturbance of dried phosphogypsum (e.g., by vehicles driving over the stacks), however, may be an important particle release mechanism. The OAR risk assessment estimated that the lifetime cancer risks from radionuclides in particle emissions from stacks range from $8x10^{-8}$ to $2x10^{-6}$. Based on these risk estimates, the OAR assessment concludes that the risk from inhaling radon emitted from phosphogypsum stacks is approximately two orders of magnitude greater than the cancer risk posed by the inhalation of fugitive dust from phosphogypsum stacks.

The OAR study did not investigate the cancer risk posed by other toxic constituents (i.e., arsenic and chromium) in phosphogypsum via particle inhalation. To supplement OAR's radiological assessment, EPA performed a screening level analysis of the risks posed by arsenic and chromium blown from phosphogypsum stacks. Using typical concentrations of arsenic and chromium in phosphogypsum, EPA calculated a lifetime cancer risk of $7x10^{-7}$ from exposure to these constituents in windblown phosphogypsum.¹³ This analysis shows that the risk posed by arsenic and chromium in inhaled phosphogypsum particles is on the order of 35 percent of the risk posed by radionuclides in inhaled particles.

Based on the these findings, the Agency concludes that phosphogypsum stacks pose a considerable air pathway cancer risk primarily as a result of radon emissions from the stacks. By summing the risk estimates for radon inhalation, radionuclides in phosphogypsum particles, and arsenic and chromium in particles, EPA estimates a total air pathway lifetime MEI cancer risk of approximately 9×10^{-5} from exposure to phosphogypsum constituents. This risk is primarily from inhalation of radon emitted from stacks (9×10^{-5}) with minor contributions from the inhalation of phosphogypsum particles containing radionuclides (2×10^{-6}) and arsenic and chromium (7×10^{-7}) . Based on the OAR estimates of risk from radon emitted from the stacks, the following plants appear to pose the greatest air pathway risks: Pasadena, Texas; Royster/Palmetto; Uncle Sam, Louisiana; Seminole; Central Phosphate; and Caribou, Idaho. As mentioned above, the stacks at Pascagoula, Mississippi; Aurora, North Carolina; Rock Springs, Wyoming; and White Springs, Florida pose lower MEI lifetime cancer risk (i.e., < 1×10^{-5}).

Proximity to Sensitive Environments

Eighteen of the 21 active U.S. phosphoric acid plants are located in or near environments that are vulnerable to contaminant release or that have high resource value. In particular:

- The Seminole facility reported in its response to the National Survey on Solid Wastes from Mineral Processing Facilities that it is located in an endangered species habitat.
- The Royster/Palmetto and Pascagoula facilities are located within 6.5 and 7.8 miles, respectively, of the critical habitat of an endangered species. The two endangered species are the Florida Manatee and the Mississippi Sandhill Crane. Because of the

^{12 &}lt;u>[bid p. 13-2</u>

¹³ This risk extinute is based on a comparison of the deut inhalation risks posed by (1) median assemic and chromium concentrations as determined by EPA's data base developed for this study and (2) average concentrations of radium-226, uranium-238, thorium-230, polonium-210, and lead-210 presented in the OAR analysis. To calculate the relative risks posed by these constituent concentrations, EPA assumed an exposure point concentration of windblown phosphogypsum in air, and applied standard cancer slope factors and exposure assumptions, such as those used in developing the acreening criteria (see Section 2.2.2), to estimate the relative contributions of carcinogenic metals and radionuclides to the inhalation risks posed by airborne phosphosypsum.

- Eight plants (i.e., Geismar, CF Chemicals, Gardinier, Pocatello, Pasadena, Pascagoula, Seminole, and Aurora) are located in 100-year floodplains. Management of wastes in floodplains creates the potential for large, episodic releases caused by flood events. (The effectiveness of flood control structures at these plants is not known.)
- The Gardinier, Pascagoula, and Aurora plants are located in a wetland (defined here to include swamps, marshes, bogs, and other similar areas). The Agrico/Mulberry, Geismar, Central Phosphates, CF Chemicais, Conserv, Royster/Palmetto, Farmland, Fort Meade, IMC, Caribou, White Springs, Royster/Mulberry, and Seminole plants are located within one mile of a wetland. Wetlands are commonly entitled to special protection because they provide habitats for many forms of wildlife, purify natural water, provide flood and storm damage protection, and afford a number of other benefits. Although the location of wetlands relative to potential contaminant sources is unknown, if contaminants released to surface water and ground water migrate to wetlands, the water quality degradation may adversely affect the wetlands.
- The Pocatello facility is located in a fault zone. Wastes managed in a fault zone may be subject to episodic releases due to earthquake-induced failure of containment systems or berms.
- The Central Phosphates and Royster/Palmetto facilities are located in an area of karst terrain characterized by sinkholes and underground cavities developed by the dissolution of carbonate rock. Solution cavities that may exist in the bedrock at this site could permit any ground-water contamination originating from the wastes to migrate in a largely unattenuated and undiluted fashion.

Risk Modeling

Based upon the evaluation of intrinsic hazard and the descriptive analysis of factors that influence risk presented above, EPA has concluded that the potential for phosphogypsum and process wastewater from phosphoric acid production to impose risk to human health or the environment is significant, if managed according to current practice. As discussed above,

- Phosphogypsum and phosphoric acid process wastewater contain a number of constituents at concentrations that exceed conservative screening criteria, phosphogypsum occasionally contains chromium concentrations in excess of the EP toxicity regulatory level, and process wastewater regularly exhibits the RCRA hazardous waste criterion for corrosivity (i.e., pH below 2.0) and exceeds EP regulatory levels for cadmium, chromium, and selenium.
- Ground-water contamination from phosphogypsum stacks and process wastewater ponds
 has occurred or is likely at almost all plants, and, at some sites, contamination has
 reached off-site wells at levels above drinking water standards.
- Episodic and continuous releases of pond and phosphogypsum stack waters to surface water occur at a number of plants, and aquatic organisms have been adversely affected by these releases.
- Radon emissions from phosphogypsum stacks and windblown phosphogypsum particles
 are estimated to present a lifetime cancer risk to maximally exposed individuals of
 almost 1x10⁻⁴.

Because of the weight of the empirical and analytical evidence summarized above, the Agency did not conduct a quantitative risk modeling exercise addressing these wastes. Section 12.3.3 provides a more detailed discussion of the Agency's conclusion that current management of phosphogypsum and phosphoric acid process wastewater poses a significant hazard.

12.3.2 Damage Cases

EPA conducted waste management case studies to assess the impacts of phosphogypsum and process wastewater management practices on human health and the environment. This review included 21 active and eight inactive phosphoric acid facilities. The inactive facilities are: Agrico, Hahnville, LA; Agrico, Fort Madison, IA; Albright & Wilson, Fernald, OH; JR Simplot, Helm, CA; Mobil Mining & Minerals, De Pue, IL; U.S. Agri-Chemicals Corp., Bartow, FL; Waterway Terminals. Helena, AR; and MS-Chemical located in Pascagoula, Mississippi. Documented damages attributable to management of phosphogypsum or process wastewater have been documented at more than ten facilities. Selected facilities are discussed in detail below.

Several factors play an important role in influencing the effectiveness of typical phosphogypsum and process wastewater management practices. Among these are water balance and soil stability. In Florida, for example, phosphogypsum dewatering and reduction of wastewater volumes are made possible due to the climate, specifically the relative amounts of precipitation and evaporation, in this region. In other areas, however, such as Louisiana, a net precipitation surplus necessitates a system dependent on planned discharges to surface waters. Soil stability appears to be much greater in Florida as well, where gypsum may be stacked to heights up to 60 meters (200 feet). In Louisiana, gypsum piles over 12 meters in height are generally considered unstable. In light of these differences, the case studies presented in this section are grouped by state.

Idaho

Nu-West Industries-Conda, Soda Springs, Idaho

The Nu-West plant is located approximately five miles north of Soda Springs, Idaho, near the abandoned mining town of Conda. The site covers approximately 650 hectares (1,600 acres). With the exception of a period from 1985 to 1987, the plant has been in operation since 1964.

Currently, Nu-West formulates and markets phosphate-based chemicals and fertilizers. The phosphogypsum waste is a by-product of the digester system, which produces ortho-phosphoric acid (P_2O_5) from phosphate ore. Gypsum is slurried with process water and pumped to two storage ponds on top of the gypsum stacks, which have been in use since 1964 and presently cover approximately 240 to 280 hectares (600 to 700 acres). The gypsum ponds are unlined; the stacks are about 46 meters (150 feet) above the natural ground surface. Drainage systems decant slurry water off the top of the higher ponds into ponds at lower elevations.

During March 1976, a dike surrounding the Nu-West cooling pond failed and released 400 acre feet of wastewater into the surrounding area. The water spread out and ponded on an estimated 20 to 40 hectares (50 to 100 acres) of farm land. The water then migrated via a natural drainage path, forming a small river that extended four miles to the south. Wastewater reportedly infiltrated into local soil and underlying bedrock along its overland migration path, but never entered a natural surface water body.

While the Idaho Division of Environment determined that dilution during spring run-off reduced surface concentrations of contaminants to within acceptable limits, the Caribou County Health Department recorded significant increases in ground-water concentrations of phosphate, cadmium, and fluoride immediately following the spill. Samples from a J.R. Simplot Company (Conda Operation) production well No. 10, located down-gradient from the Nu-West facility, show that before the spill occurred, levels of phosphate in the ground water averaged 100 mg/L, and rose to 1,458 mg/L after the spill. Levels of cadmium in the ground water averaged 0.01 mg/L before the spill and 0.239 mg/L after the spill, and levels of fluoride averaged 5 mg/L before, and 39 mg/L after, the spill, respectively. 14

¹⁴ EPA Region 10. 1988. Site Inspection Report to Nu-West Industries Conda Plant, Carlbou, Idaho. TDD F10-8702-08. March, 1988.

In 1987, EPA Region X conducted a file review and site inspection of Nu-West. This inspection included ground-water sampling, aqueous and solid sampling from the waste ponds, and a geophysical survey. A total of six ground-water samples were collected: two from on-site industrial production wells (MF well, P.W. No. 1); two off-site industrial production wells (Simplot No. 11, Simplot No. 10); and, two domestic wells in the site area. Results of the Nu-West site inspection were published in a site inspection report in March, 1988. Selenium exceeded Federal Primary Drinking Water Standards in all of the production well samples. Manganese and sulfate exceeded Federal Secondary Drinking Water Standards in Simplot Well No. 10. Phosphate was detected at 8.2 mg/L in Simplot Well No. 10, a level approximately 30 times greater than that found in the MF well and 170 times greater than that found in the background well (Simplot Well No. 11). A total of eleven target compound list (TCL) inorganic elements were detected in at least one of the domestic well samples; however, none of the sample concentrations exceeded Federal Primary or Secondary Drinking Water Standards. 15

The geophysical survey results indicated that there was no significant difference between the background and on-site values obtained from the survey. However, as stated in the EPA Site Inspection Report: There are seven registered domestic wells within a three mile radius of the Nu-West site, serving an estimated 27 people. Total depths of these wells range between 90 feet to 245 feet below ground surface. Eleven registered industrial production wells exist on and near the Nu-West site, one of which provides drinking water for approximately 45 J.R. Simplot employees in Conda (Simplot #11). At the time of the [EPA] inspection, Nu-West employees consumed bottled water due to poor water quality of the only well in use at the site (MF well).¹⁶

The EPA Site Inspection Report concludes by stating: "Levels of TCL inorganic elements and anions detected in the groundwater samples during the [EPA] site investigation were similar to those obtained by the Caribou County Health Department during non-spill event time periods. However, the levels detected during the [EPA] site investigation should not be considered indicative of stable long-term groundwater quality conditions at the site. [Data show] that significant increases in groundwater contaminant concentrations have occurred as a result of a past spill at the Nu-West facility. Although survey results are inconclusive, the data suggest that some leakage from the cooling pond may be occurring presently. If leakage from the cooling pond increases as a result of pond aging or increased water circulation, a contaminant plume may develop and migrate to the south-southwest.¹⁷

Florida

Gardinier, Inc., in East Tampa, Florida

Gardinier, Inc.'s East Thmpa Chemical Plant Complex encompasses about 2,600 acres of land and is located in west-central Hillsborough County, Florida. The facility is located at the mouth of the Alafia River adjacent to Hillsborough Bay. The plant began its operations in 1924 and has been expanded several times by various owners. In 1973, Gardinier, Inc. took over the entire operation. Gardinier, Inc. is owned by Cargill, Inc. of Minneapolis, Minnesota. Operations currently include production of phosphoric acid and phosphate and other fertilizers. 18,19

¹⁶ EPA Region 10. 1988. Site Inspection Report to Nu-West Industries Conda Plant, Caribou, Idaho. TDD F10-8702-08. March, 1988.

¹⁷ Ibid

¹⁸ Artanean & Associates, Inc. September 23, 1983. Groundwater Monitoring Plan for East Tampa Chemical Plant Complex, Hillsborough County, Florida.

^{19 [}bid.

Gardinier's on-site waste management units include two process water ponds (Nos. 1 and 2) and a gypsum stack. Process Water Pond No. 1 is an unlined pond that occupies 13 hectares (32 acres) and is 2 meters (6 feet deep); Process Pond No. 2 occupies 80 hectares and is 2.1 meters deep. The gypsum stack, which as of December 31, 1988 contained about 58 cubic meters (76 million cubic yards) of material, occupies an area of 150 hectares and is 61 meters high. The ponds on top of the gypsum stack occupy 16 hectares and are 2 meters deep. The typical pH of the liquid in the gypsum stack ponds is 1.8.²⁰

Phosphogypsum is piped to the gypsum stack as a slurry mixture (approximately 30 percent solids). The gypsum settles from the slurry and the liquid is decanted for reuse in the manufacturing process. Water which seeps through the stack is collected in a perimeter drain that is buried at the toe of the stack. The drain carries the seepage water to a sump in the northeast corner of the gypsum stack where it is pumped to an evaporation pond located on part of the gypsum stack. Surface water run-off from the exterior slopes of the stack is discharged into Hillsborough Bay.²¹

Records at the Hillsborough County Environmental Protection Commission (HCEPC) cite environmental incidents at the Gardinier facility as far back as November 21, 1973, when HCEPC investigated a citizen's complaint and discovered 210 dead crabs in traps placed near the facility's northwest outfall. The pH of the outfall water was 2.9. 22.23

Water quality violations attributable to Gardinier resulted in the following administrative actions: a Consent Order negotiated between the HCEPC and Gardinier on August 22, 1977; a Citation to Cease Violation and Order to Correct from HCPEC on November 8, 1984; a Warning Notice from the State of Florida Department of Environmental Regulation (FDER) on April 9, 1987; a Citation to Cease and Notice to Correct Violation from the HCEPC on May 26, 1988; and, a Warning Notice from FDER on October 18, 1988. These administrative actions were issued to Gardinier following unpermitted discharges from either the gypsum stack or the cooling water ponds.

The November 8, 1984 citation was issued for an untreated effluent discharge which occurred on October 8, 1984. The citation notes that "toe-drain effluent contains several thousand milligrams per liter of fluorides and phosphorus and up to 150 pico-curries per liter of radioactive substances... Also, its pH can be as low as 1.5 standard units. ²⁴ A sample of the discharge on March 30, 1987, which resulted in the April 9, 1987 warning notice, shows that the pH was 1.9, total phosphorus was 6,740 mg/L and dissolved fluorides was 4,375 mg/L. ²⁵ HCEPC analyzed a sample of the discharge which resulted in the October 18, 1988 warning notice and reported the following results: pH, 2.2; total phosphorus, >4,418 mg/L; and fluoride, 1,690 mg/L. ²⁶

The May 26, 1988 citation from HCEPC states that 'available agency records indicate a considerable history of incidents of discharge resulting in exceedances of environmental standards and contamination of the air and waters of Hillsborough County. Enforcement in each case required remedial actions intended to

²⁰ Gardinier, Inc. March 29, 1989. National Survey of Solid Wastes from Mineral Processing Facilities.

²¹ Ardamas & Associates, Inc. September 23, 1963. Groundwater Monitoring Plan for East Tamps Chemical Plant Complex, Hillsborough County, Florida.

²² Hillsborough County Environmental Protection Commission. May 6, 1988. Gardinier History.

²³ Hillsborough County Environmental Protection Commission. November 26, 1973. Interoffice Memo from Robert M. Powell to Richard Wilkins.

²⁴ Hillsborough County Environmental Protection Commission. November 8, 1984. Citation to Casse Violation and Order to Correct instead to Gardinier, Iac.

²⁵ Hillsborough County Environmental Protection Commission. March 31, 1967. Notice of Alleged Violation issued to Gardinier, Inc.

²⁶ Florida Department of Environmental Regulation. October 18, 1968. Warning Notice No. WN88-0001TW295WD issued to Gardinier, Inc.

correct the effects of the discharge where appropriate, as well as design and maintenance measures to prevent reoccurrence of the same or like incident. Despite all efforts, such incidents continue to occur. 27

HCEPC records also include a Gardinier Air Complaints Summary which lists 78 citizen complaints about the facility from December 6, 1983 to May 10, 1988. The complaints were made about noxious odors, fumes, smoke, dust or mist from the facility. One of the complaints clearly identifies the gypsum stack as the source; the relationship of the other complaints to gypsum and water management systems at the facility cannot be determined from the available documentation. HCEPC responded to most of these complaints with a phone call or site visit. At least three of the site visits resulted in HCEPC issuing a warning notice to the facility. 28

Since 1985, Gardinier has monitored ambient air quality for radon and fluoride. In 1985, Gardinier reported its average radon-222 flux from the gypsum pile to be 21.6 pCi/square meter-second (the recently promulgated NESHAP specifies a limit of 20 pCi/m²-sec). Ambient fluoride was 0.43 ppb, with a maximum reading of 1.2 ppb.²⁹ Nonetheless, Gardinier reported that no National Ambient Air Quality Standards or National Emissions Standards for Hazardous Air Pollutants were exceeded during 1988.³⁰

In addition to the impacts to surface water, biota, and air noted above, ground water at the facility has been affected by facility operations. Ground-water quality has been monitored quarterly at the facility for several years. Since January 1, 1984, standards for the following drinking water parameters were exceeded in wells located both up-gradient and down-gradient of the facility's special waste management units: chromium, radium-226 and radium-228, gross alpha, chloride, iron, manganese, pH, and total dissolved solids. Examination of data for the period 1987 through early 1989 indicates that several on-site wells in the shallow aquifer routinely exceeded the gross alpha primary drinking water standard by a factor of between 2 and 4; exceedances in the intermediate aquifer were also common, although less frequent and of lesser magnitude.

Central Phosphetes, Plant City, Florida

The Central Phosphates, Inc. (CPI) Plant City Chemical Complex is located approximately 16 km (10 miles) north of Plant City. The facility occupies approximately 616 hectares (1,520 acres) of land.³² The site is underlain by a surficial aquifer and the Floridan aquifer. The surficial aquifer ranges in depth from .3 to 15 meters (one to 50 feet) and is recharged by local rainfall.³³ In the Floridan aquifer, the uppermost useable aquifer at the site, wells are generally cased to depths greater than 200 feet.³⁴ The principal uses of the water in the uppermost useable aquifers underlying the site are rural domestic, agricultural, and commercial/ industrial.³³

Hillsborough County Environmental Protection Commission. May 26, 1988. Case No. 6169 WP. Citation to Come and Notice to Correct Violation issued to Gardinier, Inc.

²⁸ Hillsborough County Environmental Protection Commission. Undeted. Gardinier Air Complaints Summary.

²⁹ Gardinier, Inc. September 25, 1985. Pirst Annual Report submitted to the Hillsborough County Administrator pursuant to Development Order 80-713.

Gerdinier, Inc. March 29, 1989. "Netional Servey of Solid Wastes from Mineral Processing Fecilities."

³¹ Ibid.

³² Artistan & Associates, Inc., April 2, 1967, Geotechnical Evaluation and Design Recommendations for Proposed Gypsum Stack Expansion, Plant City Chemical Complex, Hillsborough County, Florids (part).

²³ Central Phosphetes, Inc., March 29, 1989, "National Survey on Solid Wastes from Mineral Procusing Facilities."

³⁴ Ardeman & Associates, Inc., August 9, 1988, Contamination Assessment Report, Central Phosphates, Inc., Plent City Phosphate Complex, Hillsborough County, Florida.

³⁵ Central Phosphates, Inc., March 29, 1989, "National Survey on Solid Wastes from Mineral Procusing Facilities."

The CPI plant began operation in December 1965: principal products include phosphate fertilizer, sulfuric acid, and ammonia.³⁶ Phosphogypsum generated during the production of phosphoric acid is disposed onsite at the company's 170 hectare (410-acre) phosphogypsum stack. A 50 hectare unlined process water cooling pond completely surrounds the gypsum stack. The depth of the cooling pond is 2.4 meters (8 feet). As of December 31, 1988, the unlined gypsum stack was 111 feet high and contained approximately 70,000,000 tons of material. The top of the gypsum stack presently contains 8 ponding areas occupying a total area of approximately 105 hectares. Two designated areas on top of the stack, located in the middle, are used for disposal of non-hazardous waste materials, such as construction and demolition debris and non-hazardous chemicals.³⁷

Activities at the Central Phosphates site have resulted in ground-water contamination in the surficial and upper Floridan aquifers. To date, it has been determined that the surficial aquifer and, to an undetermined extent, the Floridan aquifer have increased levels of fluoride, sodium, gross alpha radiation, heavy metals, sulfate, total dissolved solids, and nutrient compounds in excess of applicable guidance concentrations and/or state and federal drinking water standards. Contaminated ground water, primarily in the surficial aquifer, has migrated off-site under approximately 11 hectares (27.5 acres) of the Cone Ranch property, located south of the CPI facility. 38.39

Quarterly ground-water sampling began at the Central Phosphates facility in April 1985. Based on the results of sampling from these wells in the second quarter of 1985, a warning notice was issued to the facility by the Florida Department of Environmental Regulation (DER) for violation of the primary drinking water regulations. Maximum contamination levels for sodium and chromium were exceeded in a downgradient well in the Floridan aquifer and for sodium, chromium, and fluoride in a down-gradient well in the surficial aquifer.⁴⁰

In June 1987 the West Coast Water Supply Authority provided DER with preliminary data from laboratory analysis' of ground-water samples collected from the Cone Ranch property which indicated degradation of both the surficial and the upper Floridan aquifers.⁴¹

The final report on ground-water investigations conducted at Cone Ranch during May and June 1987, prepared by consultants to the West Coast Regional Water Supply Authority, identifies two areas of contamination on the Cone Ranch property. The report concludes that contamination in one area (designated Area A) was caused by a dike failure and resultant spill of process water from the Central Phosphates facility in 1969 and that contamination in another area (Area B) was caused by seepage of contaminated water from the recirculation pond located immediately north of the spill area. 42

A consent order addressing the ground-water contamination problems at the site was drafted by DER during July of 1987 and signed by DER and Central Phosphates, Inc. on September 29, 1987. The consent order documents violations of primary and secondary drinking water standards for chromium, sodium, fluoride, gross alpha radiation, lead, and cadmium from a down-gradient well in the surficial aquifer. These violations occurred from May 6, 1985 through April 27, 1987; maximum values listed in the consent order for each

³⁶ Ardaman & Associates, Inc., September 21, 1967, Quality Assurance Project Plan, Central Phosphases, Inc., Plant City Phosphase Complex (part).

²⁷ Central Phosphson, Inc., March 29, 1989, "National Servey on Solid Watter from Mineral Procusing Facilities."

West Coast Regional Water Supply Anthority. May 11, 1989. Letter from M. G. Korosy, Hydrologic Services Manager, to M. Trover, ICF, Inc.

³⁹ Ardsman & Associates, Inc., August 9, 1988, Conseniestion Assessment Report, Central Phosphates, Inc., Plant City Phosphate Complex, Hillsborough County, Florida.

State of Florida, Department of Environmental Regulation, Warning Notice No. 29-85-07-182, July 17, 1985.

⁴¹ Case Chronology for Central Phosphates, Inc., undeted, Florida Department of Environmental Regulation enforcement files.

⁴² Leggette, Brashears & Graham, Inc., July 15, 1967, West Coast Regional Water Supply Authority Hydrologic and Water Quality Site Investigation at Cone Ranch, Hillsborough County, Florida.

contaminant are as follows: chromium, 0.075 mg/L; sodium, 1700 mg/L; fluoride, 6 mg/L; gross alpha, 29 pCi/L; lead, 0.11 mg/L; and, cadmium, 0.022 mg/L. The consent order required Central Phosphates, Inc. to implement corrective measures and ground-water remediation at the site.⁴³

The Joint Water Quality/RCRA Overview Committee of the Florida Phosphate Council has recorded quarterly sampling data from the Central Phosphates, Inc. site from April 24, 1985 through January 18, 1989 for DER Well Nos. 1 through 6, as well as data from sampling in April 1988 for miscellaneous other wells located both on and off CPI property. These data show consistent exceedances of water quality standards in the down-gradient surficial aquifer for pH, iron, fluoride, manganese, total dissolved solids, and sulfate. Water quality standards for iron and total dissolved solids were consistently exceeded in the down-gradient upper Floridan aquifer.⁴⁴

The Contamination Assessment Report (CAR) for the CPI facility, prepared pursuant to the Consent Order, concurs with the assessment made by the West Coast Regional Water Quality Authority in its definition of two plumes of contaminated ground water which have migrated offsite. Area A was found to comprise an area of 6.3 hectares (15.5 acres) in the surficial aquifer and 2.4 hectares in the upper Floridan aquifer. The off-site areal plume within the surficial aquifer was found to extend approximately 150 meters (500 feet) south and 460 meters east of the CPI property. The plume in the surficial aquifer of Area B was found to extend approximately 150 meters south in the Cone Ranch property, covering an area approximately 5 hectares. ⁴⁵ Phase II of CPI's contamination assessment, due for completion in the near future, is to include definition of the lateral and vertical extent of contamination.

Seminole Fertilizer, in Bertow, Florida

The Seminole Fertilizer Corporation (formerly W.R. Grace & Company) Bartow Chemical Plant is located in central Polk County between the towns of Bartow and Mulberry. The plant began operation in 1954, and includes production facilities for phosphoric acid and phosphate and other fertilizers. The facility is underlain with three aquifers. The depth of the surficial aquifer ranges from 3 to 18 meters (10 to 60 ft). The intermediate aquifer ranges in depth from 18 to 61 meters. The typical depth at the facility to the uppermost useable aquifer (the Floridan) is approximately 61 meters.

Waste management facilities at Seminole include one wastewater treatment plant, nine surface impoundments, two landfills, and two phosphogypsum stacks. The wastewater treatment plant, which is a two-stage liming facility, is used only during unusually intense rainfall events. Two surface impoundments are associated with the wastewater treatment plant: surface impoundment No. 1 is the primary liming pond and surface impoundment No. 2 is the secondary pond. Surface impoundment No. 3 occupies approximately 1.3 million square feet and is used as a cooling pond for process wastewaters, while surface impoundments Nos. 4-6 are a series of interconnected cooling ponds. The pH of the process water in the cooling ponds varies from 1.8 to 2.3, due to seasonal rains. Surface impoundments Nos. 7-9 are old clay settling ponds. Of the facility's two landfills, only one is currently in use. Landfill No. 1, occupying approximately 11 hectares (28 acres), is closed. Landfill No. 2 occupies 5 hectares and is used for filter cloths and solid materials not pumped to the gypsum stack. 48

⁴³ Connent Order, September 29, 1987, between the State of Florida Department of Environmental Regulation and Central Phosphates, Inc.

Florida Phosphate Council, Joint Water Quality/RCRA Overview Committee, 1989, Groundwater Sampling Data.

⁴⁵ Ardemen & Associates, Inc., August 9, 1988, Contamination Assessment Report, Central Phosphates, Inc., Plant City Phosphate Complex, Hillsborough County, Florida.

West Coast Regional Water, Supply Authority. 1990. Latter from M. Korosy to P. Bill, ICF, Re: Cane Beach Property, Hillsborough County, Florida; Draft Mineral Processing Weste Management Case Study on Control Phosphates, Inc., May 23.

Seminole Fertilizer Corporation. March 27, 1989. "National Survey on Solid Waster from Mineral Procusing Fectilities."

Ibid.

The north gypsum stack, which first received waste in 1954, occupies approximately 65 hectares (159 acres) at an average height of 9 meters (28 ft). This stack receives process wastewater, phosphogypsum, gypsum solids from "tank clean out," and filter cloths. As of December 31, 1988, the north gypsum stack contained 14 million short tons of material. The south gypsum stack, which first received waste in 1965, occupies approximately 164 hectares at an average height of 14 meters. As of December 31, 1988, the south gypsum stack had accumulated 38 million metric tons of material.⁴⁹

Activities at the Seminole Fertilizer Corporation facility have resulted in elevated levels of several parameters in ground water in the surficial and intermediate aquifers. This contamination has affected potable water wells in the area, some of which have been replaced with water from the City of Bartow's public supply.⁵⁰

Seminole maintains eight monitoring wells as part of the ground-water monitoring system required for its state permit. Seminole has stated that MW-3 and MW-7 are up-gradient, background wells. All other wells are listed as down-gradient. The facility's ground-water data from September 1986 through March 1989 show that the down-gradient wells repeatedly exceeded the water quality standards for pH, gross alpha radiation, radium-226 and radium-228, iron, manganese, TDS, sulfate, cadmium, chromium, lead, and fluoride.⁵¹

On March 8, 1988, the Florida DER issued a warning notice to W.R. Grace & Company for violations of its ground-water monitoring permit during the third and fourth quarters of 1987. The standards for gross alpha radiation, radium-226 and radium-228, and sodium had been exceeded in some ground-water samples. The analytical results showed the following maximum concentrations for each parameter: gross alpha, 107 pCi/L; radium-226 & -228, 14.4 pCi/L; and, sodium, 657 mg/L.

In addition to on-site wells, neighboring potable water wells have also been adversely affected. Analytical data from May 1988 show that 12 of 18 wells contained at least one contaminant at levels above the drinking water standards. Contaminants that were found in the samples included arsenic, lead, sodium, gross alpha, radium-226 and radium-228, iron, pH, sulfate, and total dissolved solids. Potable water wells near the facility were replaced by a public water supply from the City of Bartow; W.R. Grace apparently paid for the water supply line installation and connection to the affected water users. 54

Seminole has also received a warning notice from the Florida DER for an unpermitted discharge of process water from the facility to Bear Branch.⁵⁵

Florida - Other

Management histories similar to those described for the above Florida facilities have also been documented by the Florida DER for CF Chemicals, Inc. and Farmland Industries, Inc. in Bartow, FL, and for Conserv. Inc. in Nichols, FL.

[&]quot; Ibid

⁵⁰ Florida Department of Environmental Regulation. September 29, 1988. Conversation Record between B. Barker, Drinking Water Section, and K. Johnson, FDER.

⁵¹ Seminole Fertilizer Corporation. June 1, 1989. Copy of facility's ground-water anceltoring data from 9/86 to 3/89.

⁵² Florida Department of Environmental Regulation. March 8, 1988. Warning Notice No. 53-88-03-061.

⁵³ W.R. Grace & Company. June 3, 1988. Letter from Glens Hall, Environmental Engineer, W.R. Grace & Co., to Kirk. Johnson, Florida Department of Environmental Regulation and ground-mater monitoring data for private potable wells adjacent to the facility.

⁵⁴ Florids Department of Environmental Regulation. September 29, 1988. Conversation Record between Bob Barter, Drinking Water Section, and Kirk Johnson, FDER.

⁵⁵ Florida Department of Environmental Regulation. May 30, 1984. Warning Notice No. 53-84-05-327.

North Carolina

Texasguif Chemicals, in Aurora, North Carolina

Texasguif's phosphate plant is located six miles north of Aurora, Beaufort County, North Carolina, near the Pamlico River. Since at least 1973, Texasguif Chemicals Company, an unincorporated division of Texasguif, Inc., has engaged in the production of calcined and dried phosphate rock, sulfuric acid, phosphoric and superphosphoric acid, and other phosphate fertilizer ingredients at the Aurora plant. 56

Waste management units include clay slurry settling ponds, two unlined cooling water ponds, gypsum stacks, and clay blend piles, which contain a mixture of clay and gypsum.

The process of purifying the ore involves the separation of very fine clay particles from the phosphate rock. The clays leave the separation process as a water based slurry that is referred to as 'slimes.' They are hydraulically transferred to settling ponds where the clear water fraction is separated and discharged. There are 5 settling ponds with discharges to South, Bond, and Long Creeks via 12 permitted outlets.⁵⁷

Two cooling water ponds are used to recirculate process water through the phosphoric acid and fertilizer manufacturing areas, where it is primarily used in acid dilution, cooling, gypsum slurrying, and operation of emission control devices. Pond No. 1, with a surface area of 49 hectares (120 acres), began operation in November 1966. Pond No. 2, with a surface area of 24 hectares, began operation in late 1973. 58

There are six gypsum stacks or piles located on the plant site. The stacks, which cover approximately 101 hectares, are surrounded by a ditch that returns excess water from the stacks to Pond No. 1. There are also a number of gypsum-clay blend piles (designated R-1, R-2, R-4, and R-5) on the site which are/were used in land reclamation activities.

The North Carolina Department of Environmental Management has recorded a number of incidents dating back to 1980 at the Texasgulf Chemicals Plant which may have resulted in negative environmental impact. These incidents include violations of Texasgulf's effluent permit and spills from the facility. For example, violations of the effluent permit for daily maximum phosphorus and fluoride were recorded in 1980 on March 12, March 13, December 9, and December 11. Daily maximum permit limits are 9 mg/L for phosphorus and 10 mg/L for fluoride. Recorded concentrations for the four days ranged from 11 to 34 mg/L for phosphorus. Fluoride concentrations were 12 mg/L on March 12 and March 13. These violations occurred when contaminated wastewater from the toe ditch of the gypsum pile overflowed into the company's fresh water system. A spill of 150,000 cubic meters (40 million gallons) of gypsum stack decant water into a nearby fresh water canal occurred on January 4, 1987 when a retaining dike around one of the gypsum stacks failed. A 24-hour analysis of the canal water showed a pH drop to a low of 4.2, with a two-hour period when pH was below 6.0. At least 18 dead fish were counted along the canal. The company was fined \$1,000 for the incident by the State of North Carolina.

⁵⁶ NC-Environmental Management Commission (EMC). April 2, 1967. Findings and Declaion and Civil Penalty Assessment.

⁵⁷ NC-Division of Environmental Monitoring (DEM). July 31, 1986. Memorsadum from J. Mulligan to R.P. Wilms, Director, NC-DEM, Re: Tetrasgulf Chemicals Co., Beaufort County.

⁵⁴ Texasguif. July 21, 1988. Preliminary Consumination Assessment at Cooling Fonds No. 1 and 2, Texasguif Inc. Phosphate Operations, Aurora, North Carolina.

⁵⁹ NC-DEM. February 25, 1986. Memorandum from R.K. Thorps to J. Mulligan, Washington Regional Office, NC-DEM. Re: Texasguil Chemicals Company, Beaufort County.

^{**} NC-DEM. February 10, 1987. Memorandum from R.K. Thorpe to L.P.Benton, Jr., Deputy Director, NC-DEM. Re: Fish Kill, Texasguif Chemicals Co.

⁶¹ NC-Environmental Menagement Commission (EMC). April 2, 1987. Findings and Decision and Civil Passity Assessment.

Recent investigations have focused on leakage from cooling ponds Nos. 1 and 2, which have resulted in ground-water contamination of the first two water-bearing zones at the site. 62 In 1988, Texasgulf commissioned a Preliminary Contaminant Assessment for Cooling Ponds 1 and 2 in fulfillment of requirements for the renewal of a zero discharge permit. As part of this study, Texasgulf installed a total of 21 monitoring wells at the site in March and April of 1988. These monitoring wells included 10 wells at Cooling Pond No. 1, nine wells at Cooling Pond No. 2, and two background monitoring wells. 63

Initial ground-water samples, obtained from monitoring wells at each of the cooling ponds during April 1988, show the results for the surficial aquifer and the Croatan Aquifer, which underlies the surficial aquifer at the site.⁶⁴ These results are displayed in Exhibit 12-6.

The first zone appears to be discharging to the facility's main effluent canal, while the direction of ground-water flow in the next zone is toward the northeast and Pamlico Sound. 65,66 Texasgulf subsequently began additional investigations to delineate the extent of contamination. 67 Initial results appear to support the initial conclusion that contamination is confined to the upper two water-bearing zones and that the Yorktown formation has prevented downward migration of contamination. 68 Texasgulf's Remedial Action Plan is currently under review by the NC-DEM.

Louisiana

Agrico Chemical Co., Donaldsonville, Louisiana

AGRICO Chemical Company's Faustina Works phosphoric acid plant, which is located in Donaldsonville, Louisiana, began operations in 1974. Approximately 68 residents inhabit land within one mile of the facility. Receiving waters are the Mississippi River and the St. James Bayou.

Gypsum waste is slurried with process wastewater to a stacking area, where the solids settle out, and the water drains into adjacent ponds or clearwells.

This facility has experienced problems with elevated concentrations of phosphorus, fluoride and acid pH levels in surface and ground waters. Emergency discharges of untreated waters to surface water have occurred periodically throughout much of the 1980s; contamination of the ground water was reported in 1986.

EPA Region VI has prohibited the discharge of gypsum into the Mississippi River. About 1983, Agrico requested a modification of its NPDES Permit from EPA to allow Agrico to discharge gypsum to the Mississippi River under certain conditions. Agrico argued that the 1973 impoundment design was based on Florida facilities, and that the Louisiana climate and soils are different. Agrico stated that the height

⁶² Tensegulf. July 21, 1988. Preliminary Contamination Assessment at Cooling Ponds No. 1 and 2, Tennegulf Inc. Phosphate Operations, Aurora, North Carolina.

⁶³ Ibjd.

⁶⁴ Texangulf. July 21, 1988. Preliminary Contamination Assumes at Cooling Fonds No. 1 and 2, Texangulf Inc. Phosphate Operations, Aurora, North Carolina.

⁴⁵ NC-DEM. December 13, 1968. Memorandum from B. Reid to A. Mouberry, Re: Temaguif, Inc. Renoval of Permit No. 2982. Cooling Ponds Nos. 1 and 2.

[&]quot;NC-DEM. January 17, 1989. Memorandum from R. Jones to C. McCaskill, Sup. State Engineering Review Unit, Permits and Engineering Branch, Re: Permit Renewal No. 2982 Cooling Ponds #1 and #2 Temagnif, Inc.

⁶⁷ NC-DEM. December 13, 1988. Memorandum from B. Reid to A. Mouberry, Re: Texasguif, Inc. Renewal of Permit No. 2982, Cooling Ponds Nos. 1 and 2.

⁶⁸ NC-DEM. June 3, 1989. Memorandum from B. Reid to R. Smithwick, Re: Temaguif, Inc. Remedial Action Plan Cooling. Ponds No. 1 and No. 2.

⁶⁹ Ardaman & Associates. February 6, 1990. Letter from T.S. Ingra and J.E. Gartanger to W.A. Schimming, Texasgulf, Re: Response to Deficiencies Noted by DEM Concerning the Cooling Pond No. 1 and No. 2 Remedial Action Plan and Proposed Revised Remedial Action Plan, Texasgulf Phosphate Operations.

Exhibit 12-6a Ground-water Quality at Cooling Ponds 1 and 2 in the Surficial Agulfer Confined Sand Layer

Parameter	State Drinking Water Standard (Mg/L)	Cooling Pond 1 (mg/L)	Cooling Pond 2 (mg/L)
Phosphorus (Total)	-	42.5 - 6,475	0.04 - 660
Fluoride	1.5	1.5 - 2.790	0.2 - 6.5
Chloride -	250	151 - 189	20 -228
Suffete	•	3.648 - 4.337	ND - 3.586
Total Dissolved Solids	500	5,685 - 27,783	255 - 4,444

Exhibit 12-6b

Ground-water Quality at Cooling Ponds 1 and 2 in the Croatan

Aquifer Confined Shell Layer

Parameter	State Drinking Water Standard (mg/L)	Cooling Pond 1 (mg/L)	Cooling Pond 2 (mg/L)
Phosphorus (Total)	•	0.3 - 125	0.05 - 32
Fluoride	1.5	0.2 - 2.5	0.1 - 0.5
Chloride	250	32 - 184	11 - 71
Sulfate	•	374 - 2,447	2.9 - 436
Total Dissolved Solids	500	915 · 6,722	219 - 1,451

limitation meant that the original 240 hectares (600 acres), which would have lasted until about 1998 would now last only until 1989.⁷⁰

In addition, Agrico stated further that "[a]nother related consequence is that the amount of contaminated run-off produced will increase geometrically as the impoundment acreage expands....Of the alternatives considered, only the "River Disposal/Partial Impoundment" option represents a reasonable and environmentally feasible alternative." Agrico concluded that "the water imbalance problem caused by continued total impoundment would result in an increased potential for the release of contaminated water."

On April 15, 1983, a portion of Agrico's 62-foot gypsum stack failed structurally and released 230,000 cubic meters (60 million gallons) of water from its 40 bectare (100-acre) pond onto plant property. 72,73,74 The

¹⁰ U.S. Environmental Protection Aguncy, Region 6. Undated. Report submitted by attorneys for Agrico Chemical Company, Kean, Miller, Hewthorne, D'Armond, McCowan & Jarmen, and Hall, Estill, Hardwick, Gable, Collingworth & Nelson, Re: Agrico Chemical Company, NPDES Permit LA0029769.

⁷¹ Ibid.

⁷⁰ Agrico. 1983. Letter from R.A. Woolsey, Plant Manager to J. Dale Givess, Administrator DNR, Re: WPCD Inspection of the Faustina Facility on April 22, 1983.

⁷⁵ Louisiana DNR. May 11, 1983. Installation inspection Forms, completed by Susan Stewart, Installation Representative.

spilled water was pumped to another gypsum holding stack; concern over the potential failure of this stack, however, led Agrico to discharge the untreated water to the Mississippi River over a period of several weeks. These discharges exceeded permit limits. After the pond failure, water of pH 2 was found flowing in an on-site drainage ditch at approximately 20 gpm into the St. James Bayou. The large volume of released water had destroyed a dam that controlled flow from the drainage ditch into the St. James Canal. Agrico reinstalled the dam on April 22, 1983, and transferred the low pH water still in the dammed section of the ditch back to the gypsum pond system. Agrico checked the water in St. James Canal, concluding that it did not seem affected by the low pH water discharged to it as a consequence of the April 15, 1983 gypsum pond failure. 77,78

Due to heavy rainfall, Agrico has continued to periodically perform emergency discharges of untreated stormwater from the clearwell, as occurred in March and again in June 1987. In its letter of notification, Agrico stated that "additional rain could result in catastrophic levee failure leading to loss of life, personal injury, or severe property damage." 79

In March 1986, Agrico reported to LA DEQ that the water along the length of the north and east phosphogypsum perimeter ditches might be "slightly impacted" by phosphate, sulfate, and fluoride. 80

In August 1986, Agrico submitted to LA DEQ a Hydrologic Assessment report for the Donaldsonville facility. LA DEQ regarded the reported situation as requiring corrective action: "Contamination of the shallow ground water, although by constituents which are not of great concern, poses a threat to drinking water. The Department's position is that the same physical characteristics that allow the contaminants to travel through the shallow silt faster than your theoretical model are present in the underlying clays."

Even under non-emergency circumstances, Agrico has had difficulty keeping in compliance with NPDES permit limitations. In April 1987, an investigator reported that discharges from Agrico's inactive gypsum impoundment (Outfall 002) were in exceedance (up to 35 times) of permitted levels. However, the investigator determined that no action would be taken "until reissuance of new permit."

In August 1987, LA DEQ determined that Agrico could not comply with the Louisiana Water Discharge Permit System that had been effective since March 1987. LA DEQ issued an Administrative Order to Agrico to allow the facility to temporarily discharge water from gypsum stacks until standards were met. 84,85,86,87

^{74(...}continued)

¹⁴ U.S. Environmental Protection Agency, Region 6. Undated. Report submitted by attorneys for Agrico Chemical Company, Kean. Miller. Hawthorne, D'Armond, McCowan & Jarman, and Hall, Estill, Hardwick, Gable, Collingworth & Nelson, Re. Agrico Chemical Company, NPDES Permit LA0029769.

⁷⁵ Ibid

N Louisiana DEO. October 25, 1984. Memorandum from Patricia L. Norton, Secretary, to J. Dale Givens, Assistant Secretary, Re: Agrico Chemical Co.

⁷⁷ Agrico. April 29, 1963. Letter from R.A. Woolney, Plant Manager to J. Dale Giwan, Administrator DNR, Re: WPCD Inspection of the Faustina Facility on April 22, 1963.

⁷⁸ Louisians DNR. May 11, 1983. Installation Inspection Forum, completed by Sunna Stewart, Installation Representative.

⁷⁹ Agrico. June 17, 1967. Letter from R.A. Woolsey, Plant Manager to Myron O. Kaudson, U.S. EPA Region 6 Director Water Management, Re: NPDES Permit Number: LA6029769. With attachment.

⁸⁰ Agrico. March 12, 1986. Letter from Susen P. Stewart, Manager, Energy and Environmental Control to Gerald Healy, Administrator, LA DEQ Solid Waste Division, Re: Agrico Phosphogypsum Site (P-0063) GD-093-0791.

Louisiana DEQ. August 22, 1986. Letter from George H. Cremer, II, Administrator to Sussa Stewart, Agrico Manager Energy and Environmental Control, Re: Hydrogeologic Assessment, Pinel Report GD-093-0791.

U.S. Environmental Protection Agency, Region 6. 1966-88. MPDES Violation Summeries, from 10/18/86 - 4/12/88.

DEQ. August 17, 1987. Inter-office Lester, from G.S. Chembers to D.J. Miller, Re: Faustina Plant - Administrative Order.

M Ibid.

According to the LA DEQ, this facility has not experienced non-compliance or emergency release problems since those outlined in this section.

Arcadian, Geismar, Louisiana

This facility, formerly owned by Allied Chemical, has been operational since 1967. The plant is situated along the Mississippi River, in Geismar, Louisiana, northeast of the intersection of LA Highways 75 and 3115. Approximately 150 residents live within 1.6 km (1 mile) of the facility.⁸⁸ There are private drinking water wells within a 1.6 km radius of the facility.^{89,90} The water table occurs at 24 meters (80 feet) below the land surface in the wet season, and 30 meters in the dry season.⁹¹ The Mississippi River receives the discharges from this facility.

The phosphogypsum waste is slurried to the stack with process wastewater, which drains into a retention pond referred to as "the clearwell." There are four clearwells of differing sizes at the site, one of which is described as active. Six phosphogypsum stacks occupy the site as well, one or two of which appear to be active.

The effluent guidelines prohibiting discharge of process pollutants from a wet phosphoric acid facility were rescinded for the plants on the lower Mississippi due to poor soil stability and excess precipitation. EPA Region 6 described the condition as follows: "The withdrawal of the guidelines allowed the creation of the concept of active and inactive impoundments. The inactive impoundment drainage may be discharged directly to the receiving stream without limits provided no further wastes are sent to the inactive system and the discharge meets water quality standards."

Two major categories of contaminant release to the environment have occurred at this facility: radioactivity releases to the ground water and clearwell discharges causing excessive phosphorus and fluoride loadings, as well as elevated pH, to surface waters. A third area of concern is fluoride fugitive emissions from the clearwell.

Arcadian has installed numerous monitoring wells throughout the gypsum stack and clearwell areas. Arcadian's ground-water monitoring report for the second half of 1988 showed gross alpha radiation in well P4 at 95 \pm 31 pCi/L and 60 \pm 14 pCi/L in well P10.⁹³ The MCL for gross alpha radiation is 15 pCi/L. These releases are not extensively documented in the files reviewed; the documents reviewed did not discuss actions taken in response to the results presented.

The net surplus of precipitation in this region has prompted Arcadian to perform emergency discharges of excess water from its clearwell. Arcadian has justified this action by stating that until the NPDES permit effluent limitations are modified, there are no other environmentally acceptable alternatives

^{(...}continued)

⁸⁵ Louisiana DEQ Water Polistica Control Division. 1987-88. Administrative Order issued by DEQ.

U.S. Environmental Protection Agency. September 8, 1987. NPDES Compliance Inspection Report.

⁶⁷ U.S. Environmental Protection Agency, Region 6. 1988. Administrative Order, Re: Agrico Chemical Company, Doctor No. VI-87-1411.

Arcadisa. April 21, 1989. "National Servey on Solid Waster from Mineral Processing Facilities."

P This

Gestry, J. January 20, 1909. Handwritten letter to LADEQ, Re: Questions and Comments on Permit Application.

Accadiso. April 21, 1989. "National Survey on Solid Waster from Mineral Procusing Facilities."

⁹² U.S. Environmental Protection Agency, Region 6. May 11, 1989. Letter from K.G. Huffman to M. Harbourt, of Kenn et al., Astorneys at Law, Re: Arondian Corporation, NPDES Parmit No. LA0066257.

⁴⁵ Arcadian. January 15, 1989. Letter from JJ. Baker to T. Hardy, OSHW LADEQ, Re: ID #GD-005-1822 Ground Water Monitoring Report.

to the emergency bypass of the clearwell water. The accumulation of facts throughout the documents suggests that excess water can cause failure of the gypsum stack or of the clearwell walls. During a discharge on February 27, 1987, Arcadian stated that the action was necessary to prevent possible injury and severe property damage. Such a discharge occurred again beginning on March 10 of the same year. During these discharges, pH values ranged from 1.3 to 2.5; phosphorus concentrations from 3,688 mg/L to 7,960 mg/L; and fluorine concentrations from 6,188 to 14,649 mg/L.

An EPA NPDES Violation Summary, based on discharge monitoring reports from March 1986 to December 1987, showed that Outfall 003 violated effluent limits each month from at least December 1985 until August 1987. No enforcement action was taken for any of these violations. Since February of 1987, the EPA inspector has noted: "No action taken - waiting for an enforceable permit." Contaminant concentrations were similar to those listed above.

On December 8, 1988, EPA Region VI issued an Administrative Order to Arcadian regarding several violations, including the discharge on October 28 of that year of calcium sulfate run-off (Outfall 003) containing total phosphorus of 8,176 lbs/day, exceeding the permitted limit of 7,685 lbs/day.⁹⁷

According to the LA DEQ, this facility has not experienced non-compliance or emergency bypass problems since those outlined in this section.

Louisiana - Other

The management histories described for the above Louisiana facilities are also typical of the other Agrico facilities (Hahnville and Uncle Sam).

12.3.3 Findings Concerning the Hazards of Phosphogypsum and Process Wastewater

Based upon the detailed examination of the inherent characteristics of phosphogypsum and process wastewater arising from the production of wet process phosphoric acid, the management practices that are applied to these wastes, the environmental settings in which the generators of the materials are situated, and the numerous instances of documented environmental damage that have been described above, EPA concludes that current practices are inadequate to protect human health and the environment from the potential danger posed by these wastes.

Intrinsic Hazard of the Wastes

Review of the available data on phosphogypsum and its leachate constituent concentrations indicates that concentrations of 12 constituents exceed one or more of the screening criteria by more than a factor of 10, and that maximum chromium and phosphorus concentrations exceed the screening criteria by factors of greater than 1,000. In addition, two samples of phosphogypsum (out of 28) contained chromium concentrations in excess of the EP toxicity regulatory level, and phosphogypsum frequently contains uranium-238 and its decay products at levels that could present a high radiation hazard if the waste is allowed to be used in an

Kenn, et al, Attorneys at Law. November 6, 1984. Letter from M.N. Harbourt to J.V. Ferguson, EPA Region 6, Re: Notice of Anticipated Bypass, NPDES Parasis No. LA6066257, Arcadian Corp., EPA File No. 7945-1.

Arcadian. February 27, 1987. Letter from M.N. Harbourt to J. Van Buskirk, EPA Region 6 and J.D. Givens, LADEQ, Re-Notice of Asticipated Bypess and Request for Order Authoriting Bypess.

Kenn, et al, Attorneys at Law. March 19, 1987. Letter from M.N. Harbourt to J. Von Buskirk, EPA Region 6, Re: Arcadian Corporation - NFDES Permit Number: LA-0060257, EPA File Number: 7945-1.

⁹⁷ U.S. Environmental Protection Agency, Region 6. December 8, 1988. Cover letter from M.O. Kaudson to H.J. Baker, Arcadian, Re: Administrative Order Docket No. VI-89-043, NPDES Permit No. LA0066257. 128/88. (Administrative Order attached).

unrestricted manner. This finding leads EPA to conclude that the intrinsic hazard of this waste is moderate to high.

Review of the available data on phosphoric acid process wastewater constituent concentrations indicates that phosphorus and phosphate are present at concentrations that sometimes are more than 100,000 times the screening criteria, arsenic and phenol are present at concentrations more than 1,000 times the screening criteria, and 15 additional constituents exceed a screening criteria by a factor of at least 10. In addition, process wastewater exhibits the RCRA hazardous waste characteristics of corrosivity (i.e., pH < 2) and exhibits the characteristic of EP toxicity (based on cadmium, chromium, and selenium concentrations). The wastewater also contains radium-226, gross alpha radiation, and gross beta radiation levels that could pose an unacceptably high radiation hazard if the wastewater is mismanaged. Based on these findings, EPA concludes that the intrinsic hazard of phosphoric acid process wastewater is high.

Potential and Documented Danger

The documented cases of dangers to human health and the environment indicate that phosphogypsum and process wastewater constituents have been released to ground water at a number of facilities and, at some sites, have migrated off-site to potable drinking water wells in concentrations that are well above hazard criteria. Based on the analysis of the damage case evidence, EPA concludes that management of phosphogypsum and process wastewater in stacks and ponds can release contaminants to the subsurface. Given the hydrogeologic setting and ground-water use patterns in the vicinity of most phosphoric acid plants, released contaminants threaten human health via potential drinking water exposures and render ground-water resources unsuitable for potential use.

Based on the analysis of the damage case evidence, it is clear that management of phosphogypsum and process wastewater in stacks and ponds can and does release contaminants to nearby surface waters. Given this evidence of releases, the proximity of most phosphoric acid plants to surface water bodies, and surface water use patterns, EPA concludes that at many phosphoric acid plants these released contaminants migrate to rivers and bays and threaten human health via drinking water exposures, threaten aquatic life, or render surface water resources unsuitable for potential consumptive uses.

EPA risk estimates demonstrate that phosphogypsum stacks pose a considerable air pathway cancer risk as a result of radon emissions from the stacks, with minor contributions from radioactive and nonradioactive constituents in windblown phosphogypsum. EPA estimates a maximum total air pathway lifetime cancer risk for a maximally exposed individual of approximately $9x10^{-5}$. This risk is primarily from inhalation of radon emitted from stacks $(9x10^{-5})$, with minor contributions from the inhalation of windblown phosphogypsum particles containing radionuclides $(2x10^{-6})$ and arsenic and chromium $(7x10^{-7})$.

12.4 Existing Federal and State Waste Management Controls

12.4.1 Federal Regulation

Section 3001(b)(3)(B)(lii) of RCRA provides the EPA Administrator with explicit authority to regulate the use of the use of solid wastes from phosphate rock processing for construction or land reclamation so as to prevent radiation exposure which presents an unreasonable risk to human health. EPA has not availed itself of this authority to date, but plans to consider regulatory options under this provision of RCRA to limit the off-site use in construction of elemental phosphorus slag, another special waste from mineral processing (see Chapter 7).

Off-site use of phosphogypsum has already been prohibited by the final National Emission Standards for Hazardous Air Pollutants (NESHAP) for radionuclides that was promulgated on December 15, 1989 (54 FR 51654). This rule requires that as of the effective date of the rule (March 15, 1990), phosphogypsum be

disposed in stacks or in mined-out areas, effectively prohibiting use as a construction material or agricultural soil supplement. 98

Under the Clean Water Act, EPA has the responsibility for setting "effluent limitations," based on the performance capability of treatment technologies. These "technology based limitations," which provide the basis for the minimum requirements of NPDES permits, must be established for various classes of industrial discharges, including a number of mineral processing categories.

Permits for mineral processing facilities may require compliance with effluent guidelines based on best practicable control technology currently available (BPT) or best available technology economically achievable (BAT). BPT effluent limitations of process wastewater from wet-process phosphoric acid, normal superphosphoric acid, and triple superphosphoric acid include (40 CFR 418.12(c)):

Pollutant	Delly Maximum	Monthly Average
Total Phosphorus	105 mg/L	35 mg/L
Fluoride	75 mg/L	25 mg/L
Total Suspended Solids	150 mg/L	50 mg/L

Effluent limitations concerning the concentrations of pollutants contained in (1) the discharge of contaminated non-process wastewater after application of BPT and BAT (40 CFR 418.12(d) and 418.13(d)), (2) discharges of process wastewater related to phosphoric acid production from existing sources after application of BAT (40 CFR 418.13(c)), and (3) process wastewater from defluorination of phosphoric acid after application of BPT and BAT are identical and as follows (40 CFR 422.52(c) and 422.53(c):

Pollutent	Daily Maximum	Monthly Average
Total Phosphorus	105 mg/L	35 mg/L
Fluoride	75 mg/L	25 mg/L

No discharges of process wastewaters from the production of phosphoric acid or from the defluorination of phosphoric acid are allowed from new sources.

In cases where the State does not have an approved NPDES program, such as Texas, Louisiana, and Florida, EPA Regional personnel have stated that EPA applies the above guidelines. However, EPA may also adopt State water quality standards for the management of these discharges, if applicable. In Idaho, which also does not have an approved NPDES program, the Federal guidelines listed above would apply. EPA Regional staff have not been available to confirm current policy regarding discharges from phosphoric acid facilities. The State of Florida does not currently have an EPA-approved NPDES program. Therefore, existing Federal regulations concerning the management of wastes from the production of phosphoric acid, would apply for facilities in this State. Wastes from phosphoric acid production are subject to the effluent limitation guidelines set forth in 40 CFR Part 418 Subpart A.

The Chevron Chemical Company phosphoric acid facility located in Rock Springs, Wyoming is situated on federal lands managed by the Bureau of Land Management (BLM). The Federal Land Policy and Management Act of 1976 (FLPMA, 43 USC 1732, 1733, and 1782) authorizes BLM to regulate mining

⁵⁶On April 10, 1990 EPA published a Notice of Limited Reconsideration that provided a limited class waiver that allows continued use of phosphogypsum for agricultural uses for the duration of the current growing season, but not to extend beyond October 1, 1990. This notice also solicited comment on alternative uses of phosphogypsum, i.e., management practices other than disposal.

⁹⁹ The limitations for defluorization process westewater also include daily maximum limits of 150 mg/L and 6-9 and monthly average limits of 50 mg/L and 6-9 for TSS and pH respectively.

activities on its lands with respect to the environmental effects of such activities. BLM regulations implementing this law (43 CFR 3809) are intended to prevent unnecessary or undue degradation of its lands, or lands that are under consideration for inclusion in the national wilderness system. These regulations provide for reclamation of lands disturbed by mining, hence, are not directly applicable to mineral processing activities.

12.4.2 State Regulation

The 21 facilities in the phosphoric acid sector are located in seven states, including Florida, Louisiana, Idaho, Mississippi, North Carolina, Texas, and Wyoming. All of these states except Wyoming were selected for regulatory review (see Chapter 2 for a discussion of the methodology used to select states for regulatory study). The majority of the 21 phosphoric acid facilities are located in Florida, Louisiana, and Idaho, which have twelve, three, and two facilities, respectively. Based on the distribution of facilities, therefore, state-level regulation of phosphoric acid processing wastes is of particular interest in the States of Florida, Louisiana, and Idaho.

As a general overview, six of the seven states with phosphoric acid processing facilities (all but Wyoming), adopt the federal exclusion from hazardous waste regulation for special wastes from mineral processing. Florida regulates wastes from the production of phosphoric acid under its solid waste rules, while Louisiana and Texas classify and manage such wastes as industrial solid waste. Mississippi and North Carolina exempt wastes generated in all types of mineral processing facilities from regulation as solid wastes. No requirements in Idaho's solid waste regulations apply to these wastes. Finally, three of seven states (North Carolina, Mississippi, and Wyoming) have EPA-approved NPDES programs while all seven states have air quality control regulations or standards that may be applicable to wastes from mineral processing facilities.

As noted above, most of the phosphoric acid processing facilities under study are located in Florida. Also as noted, Florida adopts the federal exclusion from hazardous waste regulation for mineral processing wastes. The state addresses phosphoric acid processing wastes under its solid waste regulations, though these regulations do not contain requirements pertaining specifically to phosphogypsum stacks or process wastewater cooling ponds. The state issues two types of permits for solid waste disposal activities at phosphoric acid facilities, including an industrial wastewater discharge permit (required for cooling ponds and maintained for some old stacks), and a solid waste disposal permit required of new stacks. Pecent monitoring efforts have prompted the state to establish additional controls over stacks. Florida now requires that all discharges to ground water, in addition to established zones of discharge, be addressed by an appropriate permit. The state also applies modified landfill requirements, interim requirements, and limited wastewater facilities regulations, and is in the process of modifying the solid waste regulations with regard to design and operating standards, closure requirements, and financial responsibility requirements applicable to phosphogypsum stacks and cooling ponds.

Current regulation of phosphoric acid processing wastes in Florida, therefore, consists primarily of the requirement to obtain a permit for discharges to ground water and the requirement that new stacks and expansions of existing stacks be clay-lined and undergo formal closure. Under this policy, closure requirements include cover adequate to prevent infiltration and run-off controls. Further, all cooling ponds in the state must have run-on/run-off controls. The state also may place waste disposal location restrictions, performance standards, and operating requirements on a facility's solid waste disposal permit. The Florida Department of Environmental Regulation has the authority to conduct on-site inspections, issue administrative and consent orders, and require remedial action, though it does not have the authority to fine facilities for non-compliance. Finally, although air emissions from the phosphate industry are regulated under the state's air pollution rules, state officials indicated that phosphogypsum stacks typically crust over or are managed as part of a wet system so that fugitive dust emissions traditionally have not been considered a problem.

Louisiana, with three phosphoric acid processing facilities, also excludes mineral processing wastes from regulation as hazardous waste. Louisiana classifies and regulates mineral processing wastes as industrial solid wastes. Although no requirements have been drafted specifically for phosphogypsum stacks, facility

12.5 Waste Management Alternatives and Potential Utilization

12.5.1 Waste Management Alternatives

Waste management alternatives, as discussed below, include alternative processes for manufacturing phosphoric acid and methods of purifying (i.e., reducing concentrations of radionuclides and/or other contaminants) the phosphogypsum so that it can be safely used in agriculture or construction. Direct recycling of phosphogypsum is not a viable alternative, because the phosphogypsum itself cannot be used in the production of phosphoric acid, although it is already common practice to recycle the process water used to slurry the phosphogypsum. One exception to this, as is discussed briefly in the section on utilization, is the production of sulfur dioxide (SO₂) by the thermal decomposition of phosphogypsum, which can be recycled to the manufacturing process as sulfuric acid.

Process Alternatives for Manufacturing Phosphoric Acid

There are a number of variations of the basic wet-acid process used to manufacture phosphoric acid. These alternative processes are considered in this section because the phosphogypsum that they generate may differ in its degree of hydration (hemihydrate vs. dihydrate) at the time of generation, which can determine which purification methods can be applied to the phosphogypsum, and how efficiently they can remove the impurities. In addition, the amount of preprocessing required before some types of utilization (e.g., as wall board or plaster) can also vary with the production process used. Unfortunately, there is insufficient data available to attempt an evaluation the volume, composition, or potential hazard(s) of the phosphogypsum generated by the different processes. Consequently, this discussion focuses on the differences that could be relevant to the subsequent treatment, utilization, or disposal of phosphogypsum generated by the different production processes.

Description

The processes to be discussed are the classic Prayon and Nissan-H processes which generate the dihydrate form of phosphogypsum (CaSO₄· $2H_2O$); and the Central-Prayon and Nissan-C processes, which generate the hemihydrate form of phosphogypsum (CaSO₄· $4H_2O$).

In the classic Prayon process, the dihydrate phosphogypsum is filtered out of the solution produced by the digestion of phosphate rock by sulfuric acid. The phosphogypsum is then pumped as a slurry to gypsum stacks for disposal. 100,101

In the Central-Prayon process, the dihydrate phosphogypsum is filtered out of the solution produced by the digestion of phosphate rock by sulfuric acid. The phosphogypsum is converted to the hemihydrate form by heating it and adding sulfuric acid, whereupon the hemihydrate/phosphogypsum is extracted from the acid slurry by counter-current washing, and the liquid is recycled to the phosphate rock digestion process, and the hemihydrate slurry being sent to the stacks for disposal. 102

In the Nissan-H process, the phosphate rock is digested by sulfuric acid at a high temperature which causes most of the phosphate rock to decompose and the hemilydrate form of phosphogypsum to be generat-

Pena, N., <u>Utilization of the Phosphogramson Produced in the Fertilizer Industry</u>, UNIDO/IS-533, United Nations Industrial Development Organization (UNIDO), May 1985, p. 30.

Muchiberg, P.E., J.T. Reding, B.P. Shepherd, Terry Parsons and Glynda E. Wikins, <u>Industrial Process Profiles for</u>
Environmental Use: Chapter 22. The Phosphate Rock and Besic Fertilizer Materials Industry, BPA-400/2-71-423v, Environmental Protection Technology Series, prepared for Industrial Environmental Research Laboratory, ORD, U.S. Environmental Protection Agency, February 1977, p. 21.

^{162 [}bid., p. 31.

owners/operators must comply with provisions for soils (e.g., stability, permeability), hydrologic characteristics, precipitation run-on and run-off, location standards, security, safety, and waste characterization. New stacks must have liners as well. During closure, the owner/operator must emplace a final cover or some alternate erosion control measure. Similarly, process wastewater cooling ponds must meet industrial waste surface impoundment requirements such as run-on controls, liner requirements, design standards (e.g., to prevent overtopping and minimize erosion), and waste characterization and ground-water monitoring requirements. Surface impoundments must be dewatered and clean-closed (i.e., all residuals removed) or closed according to solid waste landfill closure provisions. Owners/operators of both phosphogypsum stacks and process wastewater ponds must maintain financial responsibility for the closure and post-closure care of those units. In addition to these solid waste regulations, the three facilities in Louisiana must comply with federal NPDES permits and Louisiana Air Emissions Permits. Under the air permits, the facilities must be operated in a manner to minimize fugitive dust and could be required to undertake fugitive dust controls, such as the application of chemicals, asphalt, or water, if deemed necessary by the state. Finally, the state requires that owners/operators obtain a permit in order to construct a new facility or make a major modification to an existing facility.

Like Florida and Louisiana, Idaho, with two phosphoric acid processing facilities, excludes mineral processing wastes from its hazardous waste regulations. Unlike all of the other states with phosphoric acid processing facilities, however, Idaho does not apply any solid waste regulatory requirements to either phosphogypsum stacks or process wastewater cooling ponds. Moreover, the state does not have an approved NPDES program and, although the two facilities located in Idaho are broadly responsible for reasonable control of fugitive dust emissions, the state does not specifically address stacks or ponds in the facilities' air permits.

As noted, Mississippi, North Carolina, and Texas each have a single phosphoric acid facility and exclude those facilities from hazardous waste regulations. The facility located in Mississippi, which is not currently in operation, does have a current Mississippi NPDES permit. Because this facility disposes of its waste on site, however, the state does not require that the owner/operator obtain a solid waste management permit and does not plan to address the phosphoric acid wastes unless a threat to public health and the environment is demonstrated. The facility in North Carolina has a current North Carolina NPDES permit for its wastewaters. In accordance with a state-issued mining permit, the facility currently uses its phosphogypsum as fill for mined-out areas. The state does not regulate the stacks as solid wastes, but rather addresses them with non-discharge permits issued by the Water Quality Section of the Division of Environmental Management. North Carolina has initiated several consent agreements with the facility to address releases to surface and ground waters. The state also recently promulgated new air regulations that address radionuclide contaminants and may result in increased fugitive dust emission controls for phosphogypsum stacks. As with Mississippi, the facility in Texas has not been required to obtain a solid waste permit because it disposes of its wastes on property owned by the facility owner/operator. The facility has notified the state of its waste management activities, however, and has obtained federal NPDES and Texas wastewater discharge permits. Both North Carolina and Texas have addressed air emissions from phosphogypsum stacks only under general emission requirements. The final state with a phosphoric acid processing facility. Wyoming, was not studied in detail for this report. Wyoming appears to regulate its single facility under solid waste regulations and the state's approved NPDES program.

In summary, the two states with the most phosphoric acid processing facilities, Florida and Louisiana, appear to regulate those facilities most comprehensively. Of the remaining states, Mississippi, Texas, and Wyoming have placed fewer regulatory requirements on the phosphoric acid processing wastes managed within their borders, while Idaho has imposed essentially no requirements on the two facilities located within the state. In all cases, the wastes are addressed in general by NPDES, air, and solid waste landfill and surface impoundment requirements only, and not by regulations tailored specifically to phosphogypsum stacks or process wastewater cooling ponds.

ed. 103 The hemihydrate slurry is cooled and recrystallized to dihydrate by using seed crystals of dihydrate phosphogypsum. This recrystallization step results in the formation of phosphogypsum crystals which can be easily filtered, and are believed to be of sufficient quality to be utilized in building materials without additional treatment. 104,105

The Nissan-C process is very similar to the Nissan-H process, the main difference being that the hemihydrate slurry is recrystallized by both cooling it and changing its acid concentration, which results in phosphoric acid concentrations of 45-50 percent without evaporation (as opposed to the 30-35 percent normally produced by the dihydrate processes) and in a higher quality phosphogypsum.¹⁰⁶

Current and Potential Use

It is uncertain which of the above processes are used by each of the phosphoric acid facilities. although EPA believes that at least two or three of the facilities use one of the processes (Central-Prayon or Nissan-C) which generate hemihydrate phosphogypsum, and that the rest of the facilities use one of the processes (classic Prayon or Nissan-H) which generate dihydrate phosphogypsum.

There do not appear to be any insurmountable obstacles preventing any of the facilities from using any of the available production processes. Some of the reasons why particular facilities use, or have converted to, a particular process have been that the hemihydrate processes are more energy efficient because the phosphoric acid that they produce is more concentrated (hence, requires less evaporative concentration, which is energy-intensive), and that the dihydrate processes are easier to control and maintain. If it becomes necessary to reduce the radionuclide content in the phosphogypsum (see the discussion of phosphogypsum purification below) so that it could be utilized rather than disposed (see section 12.5.2), facilities might have more incentive to begin using one of the processes which generate hemihydrate phosphogypsum, since the two purification methods which employ acid digestion require anhydrite or hemihydrate phosphogypsum.

Purification of Phosphogypsum

Utilization of phosphogypsum in construction and agriculture is constrained by the presence of impurities and hazardous constituents in the waste. Constituents such as radium-226 and arsenic may need to be removed because of the hazards they may present to human health and the environment, while phosphates and fluorides need to be removed for technical reasons related to the methods of utilization. The impurities include insolubles such as silica sand and unreacted phosphate ore; occluded water soluble phosphoric acid and complex fluoride salts; and interstitially trapped ions within the phosphogypsum crystal lattice, such as HPO₄²⁻, AlF₄²⁻, and radioactive radium-226.¹⁰⁷

Description

Several processes for removing radium-226, as well as the other impurities, have recently been developed. These processes involve either acid digestion of the phosphogypsum or simple physical removal of the more radioactive portions of the phosphogypsum.

^{100 &}lt;u>Ibid.</u>, p. 14.

^{184 &}lt;u>[bid.</u>, p. 16.

The absence of supporting data has prevented EPA from evaluating the validity of this statement.

Muchiberg, op. cit., p. 18.

¹⁰⁷ Palmer, J.W. and J.C. Gaynor, <u>Phosphogroum Purification</u>, USG Corporation, Libertyville, Illinois, May 30, 1985, p. 1.

M Thid

¹⁸⁹ Patmer, J.W., <u>Process for Reducine Radioactive Contamination in Phosphorypsum</u>, U.S. Patent 4,338,292 to USG Corporation, June 14, 1983, p. 2.

The method of physical separation can reduce the radionuclide concentration of the phosphogypsum by approximately 30 percent. The method involves the use of a hydrocyclone to remove the phosphogypsum crystals smaller than 30 microns (which contain the greatest proportion of radionuclides) from the bulk of the phosphogypsum. 110

While the two acid digestion processes are more complicated and costly, they can remove nearly all of the radioactive constituents. The acid digestion processes are similar to one another; the primary difference between the processes is whether anhydrite (CaSO₄) or hemihydrate (CaSO₄· 1 H₂O) is used as a reaction intermediate in the purification sequence. Both processes can be applied to dihydrate phosphogypsum, although it must first be dehydrated with sulfuric acid.

During the anhydrite purification method, phosphogypsum is placed in concentrated sulfuric acid where it is dehydrated and reprecipitated as small anhydrite crystals. Most of the soluble ions are removed from the phosphogypsum, while the radium-226 is precipitated with the anhydrite. (Silica sand also remains with the solid anhydrite.) The anhydrite is rehydrated with a dilute solution of sulfuric acid at a temperature less than 43°C, and gypsum seed crystals are used to speed up the rate of hydration. The remaining anhydrite crystals, along with the radium-226, can be readily separated from the larger gypsum crystals, although some of the very small anhydrite crystals adhere to the surface of the gypsum crystals, which increases the radionuclide content of the purified phosphogypsum.

During the hemihydrate purification method, the hemihydrate slurry is cooled, purified gypsum seed crystals are added, and large crystals of purified phosphogypsum are produced. Most of the radionuclides remain in the hemihydrate crystals, and the large dihydrate phosphogypsum crystals are easily separated from the smaller hemihydrate crystals.

The dilute sulfuric acid, used to rehydrate the anhydrite or hemihydrate, contains phosphate value from the phosphogypsum that can be recovered at the phosphoric acid plant. Silica sand is removed from the slurry by hydraulic classification.

An approximately 99.5 percent pure phosphogypsum can be obtained using either of these two processes. The hemihydrate route gives a 1 pCi/g radiation level, while the anhydrite route gives a 3 pCi/g level. Natural gypsum typically contains 1 to 3 pCi/g radiation.

Current and Potential Use

In the literature reviewed by EPA, no evidence was found to indicate that any of the phosphoric acid facilities are currently purifying their phosphogypsum. Future use of the purification methods will primarily depend on how the regulations constrain the disposal and utilization of phosphogypsum (see section 12.5.2).

Of the three purification methods described above, the physical separation process has only limited potential use. Since the physical separation process will only remove 30 percent of the radium-226, the use of this process is limited to phosphogypsum containing 14 pCl/g or less of radium-226 (i.e., a 30 percent reduction from 14 pCl/g will yield 9.8 pCl/g). This is assuming that phosphogypsum with a radium-226 content of greater than 10 pCl/g could not be utilized (see 54 FR 13482, April 10, 1990).

Exhibits 12-7 and 12-8 summarize phosphogypsum radium-226 content on a regional and facility-specific basis. Facility-specific information was available for only 7 of the 21 phosphoric acid production facilities. It should be noted that phosphate ores processed in Louisiana, Mississippi, and Texas originate from Florida. The radium-226 content of the North Carolina phosphogypsum falls below the tentative threshold level of 10 pCi/g radium-226 and, therefore, would not require purification. Phosphogypsum generated in Florida, Idaho, Louisiana, and Mississippi have radium-226 concentration ranges too high for the physical separation process to purify more than a fraction of the phosphogypsum to a level below the threshold level. However, the phosphogypsum generated in Texas has a low enough radium-226 concentration that the method

¹¹⁹ Pena, N., Utilization of the Phosphogranum Produced in the Fertilizer Industry, UNIDO/IS.533, United Nationa Industrial Development Organization (UNIDO), May 1985, p. 32

Re-226 Concentrations in Phosphogypsum, Listed by State Effect of Purification Methods on Exhibit 12-7

				Ra-238 Content After Purification by Acid Digestion	ntent After Acid Digestion
eu.	Prophogypour Occasion In 1900 (ATT) ⁴⁹	Observed Rs. 228 Contract In Prosphosypuum pCiygi th	Ph-226 Content After Purification by Physical Separation (PCVg)	Using Anhydrite Phosphogypsum (pCVg)	Using Hemiliydrate Phosphogypsum (pCNg)
Florida	20,777,000	6.9 - april	4 · 27	3	-
Ideho	2,646,000	7.9 - 23 ⁴⁴	6 - 16	ن	-
Louisissa	7,500,000	1.4 - 257**	1 - 160	J	-
Madadppl	474,000	5.0 - 38 ^{M.4}	4 - 27	C	-
North Carolina	7,487,50	43.45	•	3	-
Texas	1,157,000	132 - 150	9 - 10.6	3	-
Bumada	0001608			G	-

Company responses to EPA's "National Survey of Bold Waster from Mineral Processing Facilities," conducted in 1989

1989 Weste Characteristic data provided by britishy in response to RCFA 3007.

III of Minos, Fil 8638, p. 8. May, Alexander and John W. Sweeney, Aggestment of Enthonomial Impacts Aggestated with Phonohogospeum in Florida, prepared for the U.S. Department of Interior, Bureau

Z EGBG Idaho, Inc., Evaluation of Paristics Historia of Prospecte Products and Wester, propered for the U.S. Department of Energy, DOE Contract No. DE AC07-76(D01570, March 1984, p. 18.

The phosphete rock originates in central Floride.

Re-226 Concentrations in Phosphogypsum, Listed by Facility Effect of Purification Methods on Exhibit 2-8

			S Person	Secret fe.256 Octo	S S S S S S S S S S S S S S S S S S S		Re-629 Content Albert Diges	Re-120 Content After Purification by Acid Organization
Feeliffy		Omerand In see perfern	4	3		Pa-228 Content After Particulos by Psychol Separation (pC/g)	Using Anhydrite Phosphogypeum (pCA)g)	Uchig Hembydeate Phosphogydeate Phosphogydeate
Agrico in Unico Bora	5	4,100,000		1	1		0	ı
Agrice in Donaldeon	5	2,080,000	8	162.5	63 - 80	63 - 160	9	ı
Appedies in Geisman	5	009'008	9.4	16.5	1 - 14	1 - 14	6	ı
Of Chembols in Berton	4	140,000	-	1	•		0	ı
Conserv in Mehale	4	1,108,000	8.6	3	•	. •	0	ı
MAS Fortilizer in Mulborry	4	000'008'9	•	27	13 - 28	13 - 28	6	•
Al Shapte in Pecasio	9	1,487,000 ⁴⁴	7.0	1	01 - 0	0 - 18	•	1
Tocaegust in Auron	ž	6,426,250	4.3	4.5		•	6	•
Mobil Mining in President	×	1,187,000	13.2	14.1	9 - 10.5	9-10.8	6	1

Company responses to EPA's Tutdonal Burvey of Bolid Wastes from Mineral Proceeding Facilities," conducted in 1909. 1988 Waste Chanaderistic data provided by Industry in response to RCFA 3007. Poported value is confidential; calimate made using everage waste to product ratio and facility capacity. III

of physical separation should be able to reduce the radium-226 concentration below the 10 pCi/g threshold in most of the phosphogypsum generated.

Therefore, it appears that only a small portion of phosphogypsum produced annually could be sufficiently purified by the physical separation technique. In order to reduce all the phosphogypsum to a level at or below the 10 pCi/g threshold, the purification methods using acid digestion would be required.

Factors Affecting Regulatory Status

The residuals generated by the acid digestion purification of phosphogypsum have a specific activity of up to 600 pCi/g¹¹¹, and while the purification process generates a relatively low volume of waste, it is very concentrated and may pose disposal problems that equal or outweigh those associated with the original phosphogypsum. At this time, however, EPA does not have sufficient information to articulate a position on the regulatory status of this residue. One waste management strategy which has been suggested for immobilizing the radionuclides is to blend it with waste phosphatic clay suspensions (slimes) and allow the mixture to solidify.¹¹² The discussion in Section 12.5.2 on utilization of phosphogypsum in mine reclamation provides an explanation of this approach.

While no information was found on the volume or radium-226 concentration of the waste resulting from the physical separation method, it too would produce residuals with relatively high concentrations of radium-226.

12.5.2 Utilization

Described below are a number of alternatives for utilizing phosphogypsum. Some of these uses, such as agriculture and mine reclamation, already utilize significant amounts of phosphogypsum. Other alternatives (e.g., use as a construction material) have been shown to be rechnically feasible, but for a variety of reasons have not moved beyond the developmental stage of field testing in the U.S.

At the time of this assessment, it is uncertain which, if any, of the uses discussed below will be allowed. EPA currently requires that phosphogypsum be disposed in stacks or mines, which precludes alternative uses of the material, 113 except for a limited class waiver for the agricultural use of phosphogypsum, which will be in effect until October 1, 1990. EPA has, however, announced a limited reconsideration of the rule requiring the disposal of phosphogypsum in stacks or mines, and has also given notice of a "proposed rulemaking by which EPA is proposing to maintain or modify the rule to, alternatively or in combination, (1) make no change to 40 CFR Part 61, subpart R, as promulgated on October 31, 1989, (2) establish a threshold level of radium-226 which would further define the term "phosphogypsum", (3) allow, with prior EPA approval, the use of discrete quantities of phosphogypsum for researching and developing processes to remove radium-226 from phosphogypsum to the extent such use is at least as protective of public health as is disposal of phosphogypsum in mines or stacks, or (4) allow, with prior EPA approval, other alternative use of phosphogypsum to the extent such use is at least as protective of public health as is disposal of phosphogypsum in mines or stacks. 114

Moisset, J., Location of Radium in Phosphorypsum and Improved Process for Removal of Radium from Phosphorypsum, Platres Lafarge (France) (date not known).

¹¹² Palmer, J.W. and J.C. Gaynor, <u>Method for Solidifvine Waste Slime Suspensions</u>, U.S. Patent 4,457,781 to USG Corporation, July 3, 1984, p. 4.

^{113 54} FR 51654, December 15, 1989.

^{114 55} FR 13482, April 10, 1990.

With respect to these four regulatory options, this report does not discuss options (1) or (3), other than to say that option (1) would preclude all of the alternative uses, with the possible exception of mine reclamation, and that it is unlikely that the option (3) would result in a significant reduction in the amount of phosphogypsum requiring disposal in mines or stacks.

Utilization of Phosphogypsum in Agriculture

Description

Phosphogypsum has been used in agriculture as a source of calcium and sulfur for soils that are deficient in these elements. Phosphogypsum is also incorporated into soils in order to provide sediment control for soils that have been eroded and leached to the point where they have developed a compacted crust. In addition, phosphogypsum is sometimes incorporated into acidic soils to serve as a buffering agent.

Phosphogypsum is sometimes pelletized before being applied to the soil, though the majority of phosphogypsum used for agricultural purposes is taken directly from disposal stacks, transported to local fertilizer companies, and distributed to the farmers. When the phosphogypsum is used as a fertilizer it is simply spread on the top of the soil, whereas when it is used for pH adjustment or sediment control it is tilled into the soil.

Current And Potential Use

It is estimated that 1,260,000 metric tons of gypsum are used in agriculture each year. Of this amount, approximately 221,000 metric tons is from phosphogypsum stacks, 318,000 metric tons is from phosphogypsum mines and quarries. 116

As discussed above, EPA currently requires that phosphogypsum be disposed in stacks or mines, although a limited class waiver for agricultural use of phosphogypsum is in effect until October 1, 1990. After October 1, 1990, agricultural uses of phosphogypsum will not be allowed unless EPA decides to implement regulatory options (2) or (4) identified above.

If a threshold level of radium-226 is established (regulatory option (2)), it may be possible to utilize the phosphogypsum after purification (i.e., reducing the radium-226 content) (see section 12.5.1). If the physical separation method described in section 12.5.1 were used to purify phosphogypsum, the data displayed in Exhibits 12-7 and 12-8 suggest that some of the phosphogypsum generated in the states of Florida, Idaho, Louisiana, Mississippi, North Carolina, and Texas might have a radium-226 content below the threshold level of 10 pCi/g. However, the available data are not detailed enough for EPA to estimate how much of the purified phosphogypsum at each facility would fall below the threshold level. If either of the acid digestion purification methods (see section 12.5.1) were used to purify the phosphogypsum, the data in Exhibits 12-8 and 12-9 suggest that all of the phosphogypsum generated in the U.S. would have radium-226 concentrations below the threshold level.

Factors Relevant to Regulatory Status

A 1978 radiological assessment of the application of phosphogypsum to vegetable crop land concluded that there is little reason for concern regarding potential radiological hazards from the uptake of radium-226 by vegetable plants grown in soils treated with phosphogypsum.

¹¹⁵ McElroy, Christopher J., <u>Petition of United States Gypsum Company for Partial Reconsideration and Clarification, and Opposition of United States Gypsum Company to the Petition for Partial Reconsideration and Request for Stay of the Fertilizer Institute, United States Gypsum Company, February 9, 1990.</u>

¹¹⁶ Ibid.

In a different study, data on the radium-226 content of phosphogypsum samples from Florida and Idaho were used to calculate the increase in radium-226 content of soil to which phosphogypsum is applied. The study found that the application of 1 metric tons of 40 pCi/g phosphogypsum to 1 hectare of land, and mixed in the soil to a depth of 20 cm, would increase the radium-226 content of the soil by 0.01538 pCi/g. Therefore, the application of phosphogypsum for the purpose of sulfur fertilization (assuming an application rate of 0.1 metric tons per hectare per year) would result in an increase in the soil's radium-226 content of 0.0015 pCi/g-year, while the application of phosphogypsum for the purpose of sediment control (assuming an application rate of 4.0 metric tons per hectare per year) would result in an increase in the soil's radium-226 content of 0.62 pCi/g-year. Over a period of 100 years, these application rates would cause radium-226 content in soils of 1-2 pCi/g. 117

Feasibility

It is uncertain whether future regulations will completely preclude the agricultural uses of phosphogypsum, or only limit when and how it may be used. 118 Since many farmers have continued to use phosphogypsum despite the prospect of new regulatory prohibitions, and concerns about the radium-226 found in phosphogypsum, 119 it is not unreasonable to assume that farmers would continue to use it in the future, if it remains economically competitive. However, if it becomes necessary to reduce the radium-226 content before it can be used, the additional costs are likely to reduce the amount of phosphogypsum used if purification would make phosphogypsum more expensive than the materials it competes with.

Utilization of Phosphogypsum for Mine Reclamation

Description

An alternative to the direct disposal of phosphogypsum in stacks and/or mines has been developed in which phosphogypsum is mixed with phosphatic clay suspension (a waste stream from the beneficiation of phosphate rock), and placed in a disposal site (generally the phosphate mine) where it consolidates and can be reclaimed by planting grass and trees. The process begins by increasing the solids content of the phosphatic clay suspension to 10 percent; a portion of the dewatered clay is pumped to the phosphoric acid plant and mixed with phosphogypsum from the belt-filters; the clay-phosphogypsum mixture (blend) is put into a blend tank and additional phosphogypsum from the stacks and phosphatic clay suspension are added until there are approximately 3 parts phosphogypsum to 1 part clay; the resulting blend (35 percent solids) is pumped as a slurry to the disposal site; and after the blend has had approximately one year to dewater and consolidate, it is possible to plant grass and trees on the surface. 121

Burau, R.G., Aericultural Issuect of Radium-226 in Gynnum Derived from Phonohate Fertiliner Manufacture. October 1976.

^{118 55} FR 13482 April 10, 1990.

¹¹⁹ Personal communication, Dr. Gary Gascho, University of Georgia Experiment Station, April 25, 1990.

Palmer, Jay W. and A.P. Kouloheris, Stimes Waste Solidification with Hydratable Colcium Sulfate, paper to be presented at the University of Miami Civil Engineering Department Seminar on Phosphogypsum on April 25-27, 1984, p. 279.

¹²¹ Personal communication, William A. Schimming, Environmental Affairs Manager, Temaguif Inc., April 30, 1990.

Current and Potential Use

Only Texasgulf's facility in Aurora, North Carolina is known to be using this management practice. To date, Texasgulf has used the phosphogypsum-clay blend to reclaim a 400 acre¹²² portion of a phosphate mine adjacent to the facility, and is currently utilizing phosphogypsum at about the same rate as it is being generated. ¹²³

In considering whether any of the other 18 facilities could utilize their phosphogypsum in this way, there are at least two factors which need to be considered. The first factor is that the phosphoric acid plant be located near enough to the disposal site to keep transportation costs to a minimum. The second factor is that the phosphatic clay suspension contain sufficient base (e.g., calcium carbonate) to neutralize the acids in the phosphogypsum. Some of the facilities in Idaho and Florida may be close enough to their mines to utilize their phosphogypsum (total of 45,777,691 metric tons in 1988)¹²⁴ for mine reclamation, although this is not at all certain. The facilities in Louisiana, Mississippi, and Texas could not use this option to utilize their phosphogypsum (8,911,000 metric tons in 1988)¹²⁵ because their phosphate rock is mined in central Florida, nor could the Chevron Chemical facility in Rock Springs, Wyoming (836,000 metric tons phosphogypsum in 1988), ¹²⁶ because its phosphate rock is mined in Utah. EPA does not know whether any of the phosphatic clay suspensions generated outside of North Carolina are sufficiently basic to neutralize the acids in the phosphogypsum.

Fectors Relevant to Regulatory Status

EPA believes that the utilization of phosphogypsum to reclaim mines may have a number of advantages over the current practice of placing it in stacks or mines. Specifically, having grass and trees growing over the reclaimed mine will reduce the potential for the waste to be released to surface water by erosion, or to the atmosphere as wind blown dust. It should also reduce the demand for surface impoundments needed for the disposal of phosphatic clay suspension. Finally, the reclaimed disposal sites will be more aesthetically pleasing than the stacks and mines currently used to dispose phosphogypsum. While there are no obvious disadvantages, contaminant releases from areas reclaimed in this manner, particularly to ground water is a potential problem. EPA has not found any information regarding the migration of hazardous constituents from the phosphogypsum-clay blend into ground or surface waters.

The radiological and chemical composition of the phosphogypsum-clay blend will vary widely, due to differences in phosphate ore and manufacturing processes. Texasgulf believes that its phosphogypsum-clay blend has approximately the same radionuclide concentrations as the original phosphogypsum.¹²⁷ This belief is consistent with data from central Florida in which the concentration of radium-226 is 23.8 pCi/g in phosphatic clay suspensions, and 25.9 pCi/g in the phosphogypsum.¹²⁸ While not much data on the chemical, radiological, or physical characteristics of the phosphogypsum-clay blend is currently available, North Carolina State University's, Department of Soil Science is reportedly in the process of investigating these issues.¹²⁹

¹²² The filled area was approximately 35 feet deep.

¹²³ Schimming, op. cit.

¹²⁴ Ibid.

¹²⁵ Company responses to EPA's "Nectonal Survey of Solid Wastes from Mineral Processing Facilities," conducted in 1989.

[🍱] Ibid.

¹²⁷ Schimming, op. cit.

Palmer, J.W. and A.P. Kouloheria, Simus Weste Solidification with Hidratable Calcium Sulfate, Paper to have been presented at the University of Mismi Civil Engineering Department Seminar on Phosphogypsum, April 25-27, 1984, p. 278.

Schimming, op. cit.

Feasibility

It is likely that this management alternative will have a greater level of social acceptability than current practices, which result in large, barren disposal areas. EPA does not believe that the rule requiring that phosphogypsum be disposed in stacks or mines (thereby precluding alternative uses of the material) will preclude the use of this alternative, since it does not involve putting the phosphogypsum-clay blend anywhere except in stacks and mines.¹³⁰ The greatest barriers to the use of this alternative appear to be geographic and technical in nature (see the discussion on Current and Potential Use), although there may also be some economic barriers (e.g., current practices are less expensive).

Utilization of Phosphogypsum in Construction Materials

Phosphogypsum can be utilized as a construction material in a variety of ways. The two major areas of use are in building materials and highway construction. This section describes and evaluates applications in both areas.

Description

Phosphogypsum has the same basic properties as natural gypsum and may be used as a substitute for natural gypsum in the manufacture of commercial construction products. Approximately 70 percent of the natural gypsum used in the U.S. is for the manufacture of gypsum board or partition panels. Another 19 percent is used as an additive to cement. Addition of natural gypsum to cement retards the setting time, counteracts shrinkage, speeds the development of initial strength, and increases long-term strength and resistance to sulfate etching. The remaining 11 percent of all natural gypsum use is attributable to agricultural uses (7 percent) and miscellaneous uses including the manufacture of plaster and cement. Phosphogypsum generated from the classic Prayon process for phosphoric acid production must be purified by removing phosphates, fluorides, and other impurities for it to be successfully used in the production of building materials or as an additive to cement, whereas phosphogypsum from the Central-Prayon, Nissan-H, and Nissan-C processes may often be used directly as natural gypsum substitutes without the need for purification.

Phosphogypsum from all four processes may often be used in the manufacture of cement without additional purification. One of the most promising processes for utilizing phosphogypsum in the manufacture of portland cement is the OSW-Krupp process, a modification of the Müeller-Kühne process. In this process, phosphogypsum is dried in a rotary dryer and mixed with coke, sand, and clay. The mixture is then ground, pelletized, and fed to a rotary kiln where SO₂ and clinker are formed. The SO₂ can then be passed to an acid conversion plant to produce H₂SO₄, which may be recycled to the phosphoric acid production process. The clinker is cooled and metered along with natural gypsum onto a belt conveyor feeding into a finished cement mill. 132

Phosphogypsum generated from all phosphoric acid production processes may be used successfully as a road base, when stabilized with 5-10 percent portland cement or 15-25 percent fly ash, mixed with granular soil and compacted for secondary road construction, used in a portland cement concrete mixture and compacted to form roller-compacted concrete for paving driveways and parking areas, or used as fill and subbase material. 133,134

^{130 54} FR 51654 December 15, 1989.

¹³¹ Chang, W.F. and Murray I. Mastell, <u>Easineering Properties and Construction Applications of Phosphogypsum</u>, Phosphate Research Institute, University of Miami Press, Coral Gables, Florida, 1990, p. 6.

¹³² Zellars-Williams Company, A.P. Kouloberis, principal investigator, <u>Evaluation of Potential Commercial Processes for the Production of Sulfuric Acid From Photoborypsum</u>, Publication No. 01-002-001, Florida Institute of Photobate Research, October 1981, pp. 18, 22.

¹³³ Ibid., pp. 177-189.

Current and Potential Uses

Currently, there are no major uses of phosphogypsum in the U.S. in the manufacture of building materials or in highway construction due to the low-cost availability of other suitable materials and to the ban on utilization of phosphogypsum under 40 CFR part 61, subpart R, National Emission Standards for Hazardous Air Pollutants, Radon Emissions from Phosphogypsum Stacks.

The U.S. has led the world in the mining of natural gypsum, with 20 percent of total world output. The cost of purifying and dewatering phosphogypsum and the-relative abundance of natural gypsum has historically discouraged the development of phosphogypsum as a replacement for gypsum in the manufacture of building materials in the U.S.¹³⁵ It is unlikely that there will be a significant increase in the utilization of phosphogypsum in this capacity as long as there is a relatively abundant, low-cost supply of natural gypsum in the U.S.

Utilization of phosphogypsum in the production of H₂SO₄ and cement clinker would be possible in Florida. This application is most feasible where there is a shortage of sulfur and a high demand for cement. Its potential for success in Florida depends upon the sulfur market and the ability of a fertilizer company to market the cement clinker produced. 136

Phosphogypsum has been successfully used on an experimental basis for paving and highway construction in both Texas and Florida. Phosphogypsum from Mobil's facility in Pasadena was stabilized with fly ash or portland cement and used as a road base on five test sections of city streets in La Porte, Texas. 137 In Polk County, Florida, the use of phosphogypsum as road base was demonstrated on a 2.4 km (1.5 mile) stretch of road, where it was mixed with granular soil and compacted prior to installation. Another demonstration of using phosphogypsum as a road base occurred in Columbia County, Florida, where both 100 percent dihydrate phosphogypsum and mixtures of phosphogypsum-sand were used in a 2 mile stretch of road. 139 Phosphogypsum was also used as a component (13 percent) of roller-compacted concrete, which was used to pave 2,000 square yards of driveways and parking areas at the Florida Institute of Phosphate Research in Bartow, Florida. 140

The actual commercial use of phosphogypsum as a road sub-base material has been demonstrated on a small scale in both Florida and North Carolina. In Florida it was used as sub-base roads at phosphorous processing facilities in central Florida, and as limestone substitute in the road sub-base of a section of blacktop road. In North Carolina it has been used as fill and sub-base in roads crossing swampy areas.¹⁴¹

Factors Affecting Regulatory Status

The primary regulatory concerns with respect to the disposal and utilization of phosphogypsum stem from its radium-226 content. The radium-226 is of sufficient concern that EPA currently requires phosphogypsum to be disposed of in a stack or mine, thereby precluding all of the construction uses discussed

¹³⁴⁽_continued)

¹³⁴ Collins, R.J. and R.H. Miller, Availability of Mining Wester and Their Potential for Use as History Meserial - Volume I: Classification and Technical and Environmental Analysis. FHWA-RD-76-106, prepared for Federal Highway Administration, May 1976, p. 146.

¹³⁵ Fitzgerald, J.E., Jr. and Edward L. Sensintaffar, Radiation Exposure from Construction Materials Utilizing Byproduct Gypsum from Phosphate Mining*, (date not known), p. 353.

¹³⁶ Kouloberia, <u>op. cít.</u>, p. 16.

¹⁵⁷ Chang, op. ci., p. 177.

¹³⁴ Dad, p. 178.

¹⁰⁰ Ibid., p. 183.

^{140 &}lt;u>Ibid.</u>, pp. 186-187.

¹⁴¹ Collins, op. cit. p. 146.

above. As is discussed at the beginning of this section, EPA is currently considering a number of regulatory options, two of which could conceivably allow phosphogypsum to be utilized in construction.

If a threshold level of radium-226 is established (regulatory option (2)), it may be possible to utilize the phosphogypsum after purification (i.e., reducing the radium-226 content) (see section 12.5.1). Assuming that the proposed threshold level of 10 pCi/g were adopted, and the physical separation method described in section 12.5.1 were used to purify the phosphogypsum, the data displayed in Exhibits 12-7 and 12-8 suggest that some of the phosphogypsum generated in the states of Florida, Idaho, Louisiana, Mississippi, North Carolina, and Texas might have a radium-226 content lower than the threshold value of 10 pCi/g. However, the available data are not detailed enough for EPA to estimate how much of the purified phosphogypsum would contain less radium-226 than the threshold level, or if phosphogypsum with a sufficiently low radium-226 concentration would be close enough to the potential markets for it to be economically competitive. Similarly, if one of the acid digestion purification methods (see section 12.5.1) were used to purify the phosphogypsum, the data in Exhibits 12-7 and 12-8 suggest that all of the phosphogypsum generated in the U.S. would have radium-226 concentrations lower than the threshold level.

It is not clear whether adoption of the fourth regulatory option would preclude the use of phosphogypsum in construction materials. It is likely that the determination of whether a particular use of phosphogypsum is at least as protective of human health and the environment as phosphogypsum disposal in stacks or mines, would have to be made on a case by case basis.

Feasibility

Even if it is allowed by the regulations, it is uncertain whether a significant amount of phosphogypsum would be utilized as a construction material. The basis for this conclusion is that even before the current constraints on the utilization of phosphogypsum were imposed, very little phosphogypsum has been used in construction; consumer concern over indoor radon is likely to discourage the use of products made from phosphogypsum, which may be perceived as a significant source of radon even if purified; natural gypsum is readily available in most parts of the U.S.; and there is concern about the exposure (e.g., via leaching and subsequent ingestion, see section 12.3.1) of humans to the hazardous constituents in phosphogypsum.

12.6 Cost and Economic Impacts

Section 8002(p) of RCRA directs EPA to examine the costs of alternative practices for the management of the special wastes considered in this report. EPA has responded to this requirement by evaluating the operational changes that would be implied by compliance with three different regulatory scenarios, as described in Chapter 2. In reviewing and evaluating the Agency's estimates of the cost and economic impacts associated with these changes, it is important to remember what the regulatory scenarios imply, and what assumptions have been made in conducting the analysis.

The focus of the Subtitle C compliance scenario is on the costs of constructing and operating hazardous waste land disposal units. Other important aspects of the Subtitle C system (e.g., corrective action) have not been explicitly factored into the cost analysis. Therefore, differences between the costs estimated for Subtitle C compliance and those under other scenarios (particularly Subtitle C-Minus) are less than they might be under an alternative set of conditions (e.g., if most affected facilities were not already subject to Subtitle C). The Subtitle C-Minus scenario represents, as discussed above in Chapter 2, the minimum requirements that would apply to any of the special wastes that are ultimately regulated as hazardous wastes; this scenario does not reflect any actual determinations or preliminary judgments concerning the specific requirements that would apply to any such wastes. Further, the Subtitle D-Plus scenario represents one of many possible approaches to a Subtitle D program for mineral processing special wastes, and has been included in this report only for illustrative purposes. The cost estimates provided below for the three scenarios considered in this report must be interpreted accordingly.

In accordance with the spirit of RCRA \$8002(p), EPA has focused its analysis on impacts on the firms and facilities generating the special wastes, rather than on net impacts to society in the aggregate. Therefore, the cost analysis has been conducted on an after-tax basis, using a discount rate based on a previously developed estimate of the weighted average cost of capital to U.S. industrial firms (9.49 percent), as discussed in Chapter 2. Waste generation rate estimates (which are directly proportional to costs) for the period of analysis (the present through 1995) have been developed in consultation with the U.S Bureau of Mines.

In this section, EPA first outlines the way in which it has identified and evaluated the waste management practices that would be employed under different regulatory scenarios by facilities producing wet process phosphoric acid. Next, the section discusses the cost implications of requiring these changes to existing waste management practices. The last part of the section discusses and predicts the ultimate impacts of the increased waste management costs faced by the affected facilities.

12.6.1 Regulatory Scenarios and Required Management Practices

Because the available data indicate that process wastewater and phosphogypsum may exhibit the hazardous waste characteristics of EP toxicity and/or corrosivity, these materials would in many cases be regulated as hazardous wastes under RCRA Subtitle C were it not for the Mining Waste Exclusion. A decision by EPA that Subtitle C regulation is appropriate for these wastes would therefore result in incremental waste management costs. Accordingly, the Agency has estimated the incidence, magnitude, and impacts of these costs for the facilities that generate process wastewater and phosphogypsum from wet process phosphoric acid production; this analysis is presented in the following paragraphs.

EPA has adopted a conservative approach in conducting its cost analysis for the wastes generated by the phosphoric acid sector. The Agency has assumed that process wastewater would exhibit EP toxicity and corrosivity at all facilities unless actual sampling and analysis data demonstrate otherwise; EPA's waste sampling data, indicate that process wastewater exhibits at least one characteristic of hazardous waste at all facilities from which sampling data are available. Furthermore, because of current co-management of process waters at phosphoric acid facilities, the Agency has assumed that all process wastewaters managed at the facilities have similar chemical characteristics, that is, all circulating process water is assumed to be corrosive and/or EP toxic. In reality, the aggregate process wastewater stream may be separated into different process streams; only those that are potentially hazardous would require treatment. EPA's estimated compliance costs for managing process wastewater may, therefore, be overstated.

Similarly, in following a conservative approach, the Agency has assumed that phosphogypsum would exhibit EP toxicity at all facilities unless actual sampling and analysis data demonstrate otherwise. EPA's waste sampling data indicate that EP toxicity is not exhibited at 10 of facilities that generate the material; the Agency's cost and impact analysis of phosphogypsum management is, therefore, limited to eleven facilities, only one of which was both sampled and at which phosphogypsum constituent concentrations exceed one or more of the EP toxicity regulatory levels.

The Agency has estimated the costs associated with Subtitle C regulation, as well as with two somewhat less stringent regulatory scenarios, referred to here as "Subtitle C-Minus" and "Subtitle D-Plus" (a more detailed description of the cost impact analysis and the development of these regulatory scenarios is presented in Chapter 2, above). In the following paragraphs, EPA discusses the assumed management practices that would occur under each regulatory alternative.

Process Wastewater

Subtitle C

Under Subtitle C standards, hazardous waste that is managed on-site must meet the standards codified at 40 CFR Parts 264 and 265 for hazardous waste treatment, storage, and disposal facilities. The Agency has assumed that the process wastewater and the phosphogypsum can and will be managed separately; non-

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hazardous process water is assumed to be used to transport the phosphogypsum to the management unit. Because phosphoric acid production process wastewater is a dilute, aqueous liquid, that is usually corrosive and often EP toxic, the management practice of choice under Subtitle C is treatment (neutralization and/or metals precipitation). The scenario examined here involves construction of a Subtitle C surge pond (double-lined surface impoundment) which feeds a system of concrete impoundments in which treatment is performed. Following treatment, the effluent may be reused by the facility (e.g., to slurry fluorogypsum to the gypsum stack or impoundment) just as it is under current practice. The sludge is assumed to be non-hazardous and is assumed to be disposed of in an unlined disposal impoundment or landfill.

Subtitle C-Minus

Assumed practices under Subtitle C-Minus are identical to those described above for the full Subtitle C scenario, with the exception that some of the requirements for construction and operation of the hazardous waste surge pond have been relaxed, most notably the liner design requirements.

Subtitle D-Plus

Assumed practices under Subtitle D-Plus are identical to those described above for the Subtitle C-Minus scenario. Generators of process wastewaters are assumed to pose either moderate or high risk to ground water, even if, as is true in one case in the phosphoric acid sector, the environmental conditions indicate a low risk. Therefore, all facilities meet the same requirements under both Subtitle D-Plus and under Subtitle C-Minus; ground-water monitoring, a practice that is not required under the low risk Subtitle D-plus scenario, is assumed to be required in all cases.

Phosphogypsum

Subtitle C

Under Subtitle C standards, of hazardous waste that is managed on-site must meet the standards codified at 40 CFR Parts 264 and 265 for hazardous waste treatment, storage, and disposal facilities. The Agency has assumed that the phosphogypsum can and will be managed separately from the other special waste, process wastewater; non-hazardous process wastewater is assumed to be used to transport the phosphogypsum to the management unit. Because phosphogypsum is an inorganic solid that is transported in slurry form, the management practice of choice under Subtitle C is surface impoundment disposal. EPA has determined that because of Subtitle C closure requirements, existing waste management units (gypsum stacks) would not be permissible, because of the steep (nearly vertical) angles with which they are constructed. Closure of such units would require extensive contouring and regrading (so that they could be capped effectively), such that the total area occupied by the unit at closure would greatly exceed the space occupied during its operating life. The scenario examined here involves construction of a double-lined Subtitle C surface impoundment of significant size. The gypsum would be slurried to this impoundment in much the same way as it is currently slurried to gypsum stacks. Following settling of the suspended phosphogypsum, the transport water would be removed and piped back to the process operation for reuse, just as it is under current practice.

Subtitle C-Minus

Two primary differences are assumed to exist between full Subtitle C and Subtitle C-minus. The first is the assumption that facilities could use gypsum stacks if their use is less costly than using disposal impoundments. The second difference is the facility-specific application of tailored requirements based on potential risk to groundwater at affected facilities. Under the C-Minus scenario, as well as the Subtitle D-Plus scenario described below, the degree of potential risk of contaminating ground-water resources was used as a decision criterion in determining what level of protection (e.g., liner and closure cap requirements) would be necessary to protect human health and the environment. Ten of the 11 facilities assumed to generate

potentially hazardous phosphogypsum were determined to have a high potential to contaminate ground-water resources; the eleventh was considered a low risk location.

When risk to ground water is high, facilities are assumed to be required to manage the waste in stacks lined with double synthetic liners and leachate collection and detection systems. As none of the ten facilities in high risk locations currently operate this type of unit, all would, under Subtitle C-minus, be required to build new stacks. In addition to the double composite liners, the stacks in high risk locations are required to have run-on/run-off controls and ground-water monitoring wells; both practices must be continued through the post-closure care period. In addition, the units must undergo formal closure, including a cap of topsoil and grass over a composite liner. Post-closure care must be maintained (e.g., mowing and general cap maintenance, and ground-water monitoring) for a period of 30 years.

At three of the ten facilities, where depth to groundwater allows for relatively deep impoundment construction, surface impoundment disposal of phosphogypsum is estimated to be the least cost management alternative. Composite-lined impoundments, requiring composite caps at closure, were assumed to be used at these facilities.

Chevron's Wyoming facility, the only facility in a low risk area (and the only facility at which phosphogypsum samples were determined to be EP toxic) was allowed to continue using its currently operating unit; the operator was assumed, however, to be required to install a ground-water monitoring system.

Subtitle D-Plue

As under both Subtitle C scenarios, facility operators under the Subtitle D-Plus scenario would be required to ensure that hazardous contaminants do not escape into the environment. Like the Subtitle C-Minus scenario, facility-specific requirements are applied to allow the level of protection to increase as the potential risk to ground water increases. Under Subtitle D-Plus, the facilities are also allowed to operate gypsum stacks. The stacks do not require capping at closure under this scenario, under the assumption that the natural crusting of the gypsum that occurs as the material dries would be adequately protective. Because no capping, and therefore, no reduced slope angles, are required, the stacks are built with the same dimensions as the currently operating stacks, minimizing the total basal area required and, therefore, potentially decreasing the cost of compliance. Stacks at the ten high-risk facilities are assumed to require composite liners, single leachate collection systems, and ground-water monitoring. The one low-risk facility is assumed to continue operating its current stack. All eleven facilities are assumed to be required to install run-on/run-off controls and would continue the practice through the post-closure care period.

12.6.2 Cost Impact Assessment Results

Process Wastewater

Results of the cost impact analysis for the process wastewater generated by phosphoric acid facilities are presented by facility and regulatory scenario in Exhibit 12-9. Of the 21 facilities generating process wastewater, all are expected to incur costs under the Subtitle C regulatory scenario. Under this scenario, the annualized regulatory compliance costs would be \$3.2 to \$26.3 million greater than the baseline waste management costs, with a sector total of \$225 million per year over baseline costs. Annualized new capital expenditures range from \$1.1 to 11.7 million with a sector total of \$101.8 million. At the majority of the facilities, capital costs account for 45 percent of the total annualized compliance cost, with the cost of wastewater tank treatment dominating overall costs.

Under the Subtitle C-Minus and D-Plus scenarios, the annualized compliance costs drop only slightly, due to relaxed technical standards for operation of the surge ponds used to hold the wastewater prior to treatment. Annualized compliance costs under Subtitle C-Minus range from \$3.0 to \$25.6 million; the sector total is estimated to be \$215 million. Annualized costs under Subtitle D-Plus are nearly identical, with a

Exhibit 12-9
Compliance Cost Analysis Results for Management of Process Wastewater from Phosphoric Acid Production^(a)

	Bessine Waste			Incr	emental Cos	to of Regula	tory Compile	nce		
	Management Cost		Sublitie C		84	abilitie C-Min	400	S	ublitie D-Pk	48
Facility	Annual Total (6 000)	Annual Total (9 000)	Total Capital (\$ 000)	Annual Capital (\$ 000)	Annual Total (\$ 000)	Total Capitel (8 000)	Annuel Capital (\$ 000)	Annual Total (\$ 000)	Total Capital (\$ 000)	Annual Capital (\$ 000)
Agri Chem - Bertow, FL	206	5,049	15,488	2,311	5,537	13,781	2,056	5,434	13,781	2,056
Agrice Chemical - Donaldsonville, LA	297	12,131	39,213	5,851	11,677	36,708	5,477	11,677	36,706	5,47
Agrico Chemical - Mulberry, FL	200	11,096	32,230	4,611	10,654	29,795	4,446	10,551	29,795	4,44
Agrico Chemical - Uncle Sam, LA	314	15,541	50,321	7,509	14,975	47,193	7,042	14,872	47,193	7,04
Arcadian - Golomer LA	247	5,375	16,160	2,414	5,162	15,022	2,241	5,059	15,022	2,24
Central Phosphales - Plant City, FL	320	22,313	66,915	10,263	21,080	62,058	9,260	21,080	62,058	9,26
CF Chemicals - Bartow, FL	. 600	6,950	19,436	2,900	6,610	17,578	2,623	6,507	17,578	2,62
Chevron - Rock Springs, WY	201	4,760	12,430	1,656	4,504	11,043	1,648	4,402	11,043	1,64
Conserv - Michola, FL	261	3,213	8,004	1,194	3,048	7,110	1,061	2,946	7,110	1,06
Fermiand Industries - Bartow, FL	265	6,817	18,332	2,735	6,465	16,399	2,447	6,362	16,399	2,44
Gerdinier - Piverview, FL	836	16,544	51,094	7,624	15,633	46,047	6,871	15,530	46,047	6,67
MAC Fortilizer - Mulberry, FL	326	26,309	79,067	11,796	25,619	75,236	11,226	25,516	75,236	11,220
Mobil Mining - Pecedone, TX	276	0,023	24,178	3,600	7,630	22,068	3,293	7,535	22,068	3,29
Nu-Bouth Industries - Passagoule, MS	519	7,871	26,091	3,863	7,491	24,013	3,583	7,386	24,013	3,58
Nu-West - Sode Springs, ID	200	5,743	16,424	2,451	5,464	14,899	2,223	5,361	14,899	2.22
Occidental Chemical - White Springs, FL.	824	12,700	36,656	5,499	12,256	33,912	5,060	12,153	33,912	5,06
Royeler - Mulberry, FL	624	6,506	17,902	2,671	6,192	16,183	2,415	6,069	16,183	2.41
Roysler - Palmetto, FL	549	10,719	36,137	5,392	10,197	33,262	4,963	10,094	33,262	4.96
Seminole Fertilizer - Bertow, FL	520	12,940	37,186	5,549	12,434	34,356	5,126	12,331	34,356	5,12
JR Simplet - Possielle, ID	665	5,360	14,958	2,232	5,093	13,452	2,007	4,990	13,452	2,00
Texasguil - Aurora, NC	309	18,166	62,169	9,276	17,393	57,893	8,636	17,290	57,893	8,63
Total:	8,697	225,033	662,629	101,857	215,121	628,007	93,706	213,167	628,007	93,70
Avetage:	424	10,716	35,508	4,850	10,244	29,905	4,462	10,151	29,905	4,4

⁽e) Values reported in this table are those computed by EPA's cost estimating model and are included for illustrative purposes. The data, assumptions, and computational mathods underlying these values are such that EPA believes that the compliance cost estimates reported here are precise to two significant tigures.

sector total estimated at \$213 million; the slight difference is due to differences in assumed permitting requirements and associated costs.

Phosphogypsum

Results of the cost impact analysis for the phosphogypsum generated by phosphoric acid producers are presented by facility and regulatory scenario in Exhibit 12-10. Of the 21 facilities generating phosphogypsum, a maximum of 11 may generate potentially hazardous waste and incur costs under the Subtitle C regulatory scenario. Under this scenario, the annualized regulatory compliance costs would range, for those eleven facilities, from \$10.8 million to \$185 million over and above baseline waste management costs, with a sector total of \$684 million per year. Annualized new capital expenditures account for the vast majority (80 percent) of incremental costs, ranging from \$8.4 million to \$147 million greater than baseline, with a sector total of \$542 million. The primary reason for these extreme compliance-related capital expenditures is the large size of the Subtitle C disposal impoundments that would be needed to contain a 15 year accumulation of phosphogypsum at most facilities.

Under the less rigorous, risk related technical requirements of the Subtitle C-Minus scenario, the annualized compliance costs would be \$1.2 million to \$65.3 million greater than the baseline waste management costs, with a sector total of \$216.7 million per year. Annualized new capital expenditures would range from \$0.4 to \$51.2 million, with a sector total of \$171 million. The decrease in compliance costs between the two Subtitle C scenarios is primarily a function of the assumption that modified stacks could be used under the Subtitle C-Minus scenario; the primary design modification involves a decrease in the slope of the stacks to allow for effective capping at closure. In addition, facilities located in low risk areas (one in this sector) could continue to operate their current stacks, and would simply be required to retrofit run-on/run-off controls and install ground-water monitoring systems. Facilities in high risk areas (the remaining ten facilities), incur higher costs due to requirements for double liners/leachate collection systems, increased basal area due to limitations on slope, and capping at closure. For three facilities, the costs of building new stacks that complied with these requirements were estimated to be higher than those of building similarly protective disposal impoundments; accordingly, for costing purposes, these facilities were assumed to build impoundments rather than gypsum stacks.

Under the Subtitle D-Plus regulatory scenario, the annualized compliance costs would be \$0.48 to \$62.2 million greater than the baseline waste management costs, with a sector total of \$48.7 million per year. Annualized new capital expenditures would range from \$0.1 to \$52 million, with a sector total of \$166 million. The distribution of costs is identical to that of the C-Minus scenario, while the overall magnitude of the costs is about 25 percent less. The primary reason for the decrease is that, because no capping is required, facilities can operate stacks with slopes identical to current practices; this reduces the basal area needed and hence, the costs of liners and leachate collection systems. In addition, the actual costs of capping are not incurred. As under Subtitle C-Minus, the one facility located in a low risk area is assumed to continue operating its current stack, but would retrofit needed controls. Ground-water monitoring is not required for this facility, due to its low risk location.

12.6.2 Financial and Economic Impact Assessment

In order to evaluate the ability of affected facilities to bear these estimated regulatory compliance costs, EPA performed an impact assessment which consists of three steps. First, the Agency compared the estimated compliance costs to the financial strength of each facility, to assess the relative magnitude of the financial burden that would be imposed in the absence of changes in supply, demand, or price. Next, EPA conducted a qualitative evaluation of the salient market factors which affect the competitive position of the phosphoric acid producers, in order to determine whether compliance costs could be passed on to labor markets, suppliers of raw materials, or consumers. Finally, the Agency combined the results of the first two steps to predict the net compliance-related economic impacts which would be experienced by the facilities

Exhibit 12-10

Compliance Cost Analysis Results for Management of Phosphogypsum from Phosphoric Acid Production^(a)

	Baseline Waste	i ·		Incres	nestal Cost	is of Progulate	ery Compile	nce		
	Management Cost		Subtitle C		8	ubitile C-Min		S	abilitie D-Plu	•
Feelbly	Annual Total (\$ 600)	Annual Total (8 000)	Total Capital (6 000)	Annual Capital (\$ 900)	Annual Total (\$ 900)	Total Capital (\$ 900)	Annual Capital (\$ 000)	Annual Total (\$ 000)	Total Capital (\$ 000)	Annual Capital (\$ 000)
Agri Chem - Barlow, Fl.	409	17,310	90,806	13,549	11,760	60,101	6,966	11,645	64,067	9,560
Agrice Chemical - Mulberry, Fl.	1,057	41,366	220,518	32,904	20,455	110,917	16,550	11,906	66,627	9,942
Agrico Chemical - Uncle Sem, LA	3,856	99,755	534,366	70,737	65,361	343,515	51,257	62,242	352,204	52,55
Central Phosphates - Plant Chy, FL	1,547	195,043	965,326	147,023	30,160	164,700	24,575	17,687	101,203	15,10
Chevron - Flock Springs, WY	434	10,865	56,316	6,403	1,276	2,696	402	483	875	131
Gardiniar - Filverview, FL	694	117,107	621,515	92,736	21,409	114,562	17,094	12,750	70,161	10,46
Mobil Mining - Pasadona, TX	962	46,659	247,207	36,886	12,877	88,198	10,176	7,426	40,059	5,97
Nu-South Industries - Pascagoule, MS	710	62,426	330,400	49,300	13,060	69,336	10,346	7,414	40,255	6,00
Nu-West - Sode Springs, ID	1,011	11,969	62,746	9,363	8,063	41,055	6,126	7,960	41,055	6,12
Occidental Chemical - White Springs, FL	1,200	27,712	149,079	22,245	18,916	100,310	14,968	18,813	100,310	14,96
Royeter - Palmetta, FL	334	64,115	336,993	50,582	13,362	70,715	10,552	7,661	41,498	6,194
Total:	13,112	684,588	3.637.296	542,730	216,736	1,146,105	171.013	166,100	918.313	137.02
Average:	1,102	62,235	330,063	49,339	19,703	104,191	15.547	15,108	63.483	12.45

Values reported in this table are those computed by EPA's cost collecting model and are included for illustrative purposes. The data, assumptions, and computational methods underlying these values are such that EPA believes that the compilance cost estimates reported here are precise to two significant figures.

Facilities evaluated here as generating potentially hazardous wasts include those for which no sampling data exists.

being evaluated. The methods and assumptions used in this analysis are described in Chapter 2 and in Appendices E-3 and E-4 to this report.

Financial Ratio Analysis

Process Wastewater

EPA believes that costs of compliance under full Subtitle C would have at least marginally significant impacts on all 21 facilities, as reflected by the screening ratio results in Exhibit 12-11. Annual compliance costs as a percent of value of shipments or value added are expected to be from one to five percent at 18 of the 21 facilities; for the remaining facilities, the screening ratio results range from five to seven percent. The compliance capital as a percent of annual sustaining capital is high for all 21 facilities, ranging from 14 to 73 percent. The financial impacts under prospective Subtitle C-Minus and D-Plus regulation would be similar in distribution and magnitude to those of the Subtitle C scenario.

Phosphogypsum

Regulation under Subtitle C would have a highly significant financial impact on any phosphoric acid facilities whose phosphogypsum is found to be hazardous (phosphogypsum was EP toxic at only one facility that was sampled, therefore, the remaining ten facilities for which costs were estimated might or might not actually experience impacts). As shown in Exhibit 12-12, the annualized incremental costs associated with waste management under Subtitle C represent 4 to 40 percent of both the value added and the value of shipments for all affected facilities generating potentially hazardous phosphogypsum. Moreover, the ratio of annual capital costs to annual sustaining capital investments also suggests severe impacts for these facilities, with screening ratio results ranging from 80 to 700 percent.

The financial impacts under Subtitle C-Minus regulation would be much less than under the full Subtitle C scenario. One facility, located in a low risk area, is estimated to incur no impacts under Subtitle C-Minus. Interestingly, this is the only facility for which waste sampling actually indicated EP toxicity. For the remaining ten facilities, impacts on the value of shipments or value added range from 3 to 13 percent.

Estimation of impacts under the Subtitle D-Plus scenario indicates that for three of the ten affected facilities, there is no difference from the Subtitle C-Minus scenario (the facility in the low risk area again experiences no impacts). One of the remaining seven facilities experiences only slightly lower impacts (5 percent less than C-Minus); the remaining six facilities experience reductions in the magnitude of impacts of 43 percent from the C-Minus scenario. Annualized capital as a percent of sustaining capital investments is high even under the Subtitle D-Plus scenario; screening ratio results for the ten affected facilities range from 55 to 229 percent.

Market Factor Analysis

General Competitive Position

The U.S. is the world's leading producer of phosphoric acid, the primary use of which is in fertilizers; other uses for phosphoric acid include autrient supplements for animal feeds, builders for detergents, water softeners, additives for food, and pharmaceuticals. Domestic acid production is based on large quantities of high-quality phosphate rock reserves, located principally in Florida and North Carolina. These deposits provide abundant feedstock for high-quality phosphoric acid production. In recent years, Morocco has become the United State's main competitor in international markets. This competition has resulted in a downward price trenc for phosphate in these markets. The fact that the U.S. is a major exporter of phosphate rock is an indication of the quality and relative cost of its phosphate reserves. However, low-cost, high-quality deposits do not guarantee profits in the phosphate rock and phosphoric acid markets. During difficult economic times, the use of phosphoric acid can decline despite being offered at a fairly low price. Fertilizer

Exhibit 12-11

Significance of Regulatory Compliance Costs for Management of Process Wastewater from Phosphoric Acid Production^(a)

		Subtitle C			ubtitle C-Minu	ið	5	iubtitle D-Plus	
Facility	CC/VOS	CC/VA	IFVK	CC/VOS	CC/VA	IRVK	CC/VO\$	CCNA	IR/K
Agri Chem - Berton, Fi.	1.00%	1.87%	10.0%	1.db%	1.77%	14.2%	1.57%	1.74%	14.2%
Agrico Chemical - Donaldeonville, LA	3.06%	3 40%	35.5%	2.95%	3.20%	33.2%	2.95%	3 28%	33.2%
Agrico Chemical - Mulberry, FL	2.37%	3.74%	35.1%	3.23%	3.50%	32.4%	3.20%	3.56%	32.4%
Agrico Chemical - Uncle Sam, LA	2.03%	3.14%	32.8%	2.73%	3.03%	30.8%	2.71%	3.01%	30 8%
Areadlen - Galemar, LA	2.07%	4,00%	30.0%	3.53%	3.02%	36.0%	3.46%	3.84%	36.8%
Control Phosphotos - Plant City, Fl.	3.91%	4.34%	49.2%	3.00%	4.10%	30.9%	3.69%	4.10%	38.9%
CF Chantasis - Barton, Ft.	G.22%	7.03%	63.4%	8.02%	0.68%	67.3%	5.92%	6.58%	57.3%
Chevren - Rock Springs, WY	2.47%	2.78%	23.1%	2.34%	2.80%	20.5%	2.28%	2.54%	20.5%
Conserv - Michala, FL	1.77%	1.97%	15.0%	1.00%	1.87%	14.1%	1.62%	1.60%	14.1%
Farmland Industries - Bartow, FL	1.50%	1.72%	14.9%	1.47%	1.63%	13.4%	1.45%	161%	13.4%
Garcifolor - Fibrarylam, FL	4.07%	4.02%	45.1%	3.00%	4.27%	40.6%	3.82%	4.26%	40.6%
MAC Fortilizer - Mulberry, FL	2.22%	2.40%	23.9%	2.18%	2.40%	22.7%	2.15%	2.39%	22.7%
Mobil Mining - Passalone, TX	3.00%	4.00%	39.4%	2.40%	3.00%	38.0%	3.43%	3.61%	36 0%
Nu-South Industries - Pascagoula, MS	4.77%	5.31%	56.7%	4.54%	5.05%	62.2%	4.48%	4.96%	52.2%
Nu-West - Beds Springs, ID	2.61%	2.90%	26.6%	2.40%	2.70%	24.3%	2.44%	2.71%	24.3%
Occidental Chemical - White Springs, FL	1.90%	2.20%	20.5%	1.90%	2.11%	18.8%	1 88%	2.09%	18.8%
Royster - Mulbarry, FL	2.47%	2.74%	24.4%	2.35%	2.61%	22.0%	2.31%	2.57%	22.0%
Royster - Palmetto, FL	6.00%	6.70%	73.0%	5.79%	6.43%	67.7%	5.73%	6 37%	67.7%
Benincie Ferilizer - Barton, FL	2.91%	3.23%	30 0%	2.80%	3.11%	27.7%	2.77%	3 00%	27.7%
JR Simplot - Pocalello, ID	2.49%	2.76%	24.8%	2 36%	2.62%	22.3%	231%	2.57%	22.3%
Texasguil - Aurora, NC	2.01%	2.24%	24 7%	1.93%	2.14%	23.0%	1.91%	2.13%	23 0%

CC/VOS - Compliance Costs as Percent of Sales

CC/VA - Compliance Costs se Percent of Value Added

IR/K -- Annualized Capital Investment Requirements as Percent of Current Capital Outlays

(a) Values reported in this table are based upon EPA's compliance cost estimates. The Agency believes that these values are precise to two significant figures

Significance of Regulatory Compliance Costs for Management of Phosphogypsum from Phosphoric Acid Production (a) Exhibit 12-12

6.9% 13.9% 80.2%	184K 83.0% 239.9% 349.9% 618.2%	CC/VOS 3.4% 8.2% 11.9% 8.3%	CC/VA 3.0% 6.9% 13.2% 5.9%	120.01 120.01 120.01 1224.118	CC/VOS 34% 36% 11.3% 31%	CC/VA 3.7% 4.0% 12.6% 3.5%	184K 88.2% 72.4% 229.9%
30.2% 30.2%	238.9% 348.9% 618.2%	3.7% 8.2% 11.8%	3.8% 6.8% 19.2% 5.8%	62.1% 120.6% 224.1%	30%	37% 40% 126% 35%	98.2% 72.4% 229.9% 63.5%
13.5% 20.5%	238.8% 348.6% 618.2%	9.2% 11.9% 5.3%	6 8% 19.2% 5 8%	120.6% 224.1% 103.3%	30% 11.3% 3.1%	4.0% 12.6%	72.4% 229.6% 03.5%
70.00 70.00	349.6% 618.2%	11. 9% 5.3%	13.2% 5.9%	224.1% 103.3%	11.3%	12.6% 3.5%	229.9%
36.0%	610.2%	5.3%	5.9%	103.3%	3.1%	3.5%	63.5%
	-		֡				
9.3%	104.8%	0.7%	0.7%	5.0%	0.3%	0.3%	1,6%
X0.0x	548.1%	5.3%	5.9%	101.0%	3.1%	3.5%	81.9% 10
22.7%	100.2%	5.9%	9.5%	111.2%	3.4%	36%	85.3%
42.1%	710.5%	7.9%	9.0%	150.8%	4.5%	5.0%	97.5%
9.1%	102.3%	3.7%	4.1%	87.0%	. 3.6%	4.0%	67.0%
4.9%	82.8%	2.9%	3.3%	85.7%	2.9%	32%	55.7%
40.0%	\$60.0%	7.9%	9.4%	143.9%	4.4%	3.67	94 5%
			104.9% 548.1% 403.2% 718.5% 102.5% 82.9%	104.9% 0.7% 548.1% 5.3% 405.2% 8.9% 710.5% 7.9% 102.5% 3.7% 82.9% 2.9%	104.0% 0.7% 0.7% 1 640.1% 0.3% 5.9% 1 400.2% 0.8% 0.8% 1 710.5% 7.9% 0.8% 1 102.5% 3.7% 4.1% 0.6% 1 600.0% 7.9% 0.4% 1	104.9% 0.7% 0.7% 5.0% 648.1% 5.3% 5.9% 101.0% 403.2% 5.9% 101.0% 111.2% 111.2% 102.3% 7.9% 8.8% 150.8% 87.0% 82.9% 5.5% 5.5% 5.5% 5.5% 5.5% 5.5% 5.5%	104.0% 0.7% 0.7% 5.0% 0.3% 648.1% 5.3% 5.0% 101.0% 3.1% 403.2% 5.0% 6.0% 111.2% 3.4% 710.3% 7.0% 8.0% 150.0% 4.5% 102.3% 3.7% 4.1% 87.0% 3.5% 82.0% 2.0% 3.5% 55.7% 2.0% 900.0% 7.0% 8.6% 143.0% 4.4%

PAX ...

Compliance Costs as Percent of Sales Compliance Costs as Percent of Value Added Assualized Capital Investment Requirements as Percent of Current Capital Outlays

Values reported in this table are besed upon EPA's compliance cost estimates. The Agency believes that these values are precise to two significant ligures.

Facilities evaluated here as generating potentially hazardous waste include those for which no sampling data exists.

use is in part discretionary, and selection of types and amounts of various fertilizer types can vary. Despite its fairly competitive position versus other world suppliers, therefore, the profit margins for phosphoric acid and phosphate rock may often be somewhat restricted.

Throughout the 1990's, domestic production of phosphoric acid is expected to remain constant, while foreign production is expected to increase by less than 2.5 percent per year. Both domestic and foreign demand for phosphoric acid are expected to grow by less than 2.5 percent per year during the 1990's.

Potential for Compliance Cost Pass-Through

Labor Markets. There has been considerable restructuring in the phosphate industry with some associated wage concessions. The potential for further labor concessions is not known.

Lower Prices to Suppliers. The ability to pass through costs to input markets is not particularly relevant because the major phosphoric acid producers are integrated.

Higher Prices. Higher prices are generally difficult to impose except during periods of worldwide prosperity. The price of phosphate rock and phosphoric acid depends a great deal on competition from Morocco, the price of alternative fertilizers, and the use of slow release fertilizers.

Evaluation of Cost/Economic Impacts

EPA believes that regulation of phosphogypsum as a hazardous waste under RCRA Subtitle C would impose potentially severe impacts on facilities at which this waste exhibits EP toxicity; the number of such facilities is highly uncertain but is at least one and likely to be two or three. Mitigation of the severe cost impacts that would be experienced by the affected phosphoric acid producers under Subtitle C would be unlikely, because of the limited potential for compliance cost pass-through (at least 10 of the 21 active domestic producers would experience no impacts), and the operational reality that a substantial quantity (approximately five tons) of phosphogypsum is generated for every ton of phosphoric acid produced using the wet process. Therefore, EPA believes that regulation of phosphogypsum as a hazardous waste could pose a threat to the continued operation of any producer whose phosphogypsum tested EP toxic. Regulation under Subtitle C-Minus would also impose significant impacts at most facilities. The prospect of regulation of phosphogypsum under the Subtitle D-Plus scenario examined here would be unlikely to pose a threat to the continued viability of the majority of the phosphoric acid facilities. For 18 of the 21 active producers, no significant impacts would be incurred in managing phosphogypsum under Subtitle D-Plus regulations. At least three facilities, however, and one in particular, would be expected to incur significant impacts in managing phosphogypsum even under Subtitle D-Plus, potentially posing a threat to the economic viability of these facilities. One of those three facilities, however, is currently planning/constructing a new stack which is expected to be lined and employ a leachate collection system; estimated costs in meeting Subtitle D-Plus requirements may therefore actually have been incurred by that facility while this report was being prepared; in that event, Subtitle D-Plus regulation would not impose any costs or impacts on this facility.

The Agency also expects that regulation of process wastewater as a hazardous waste under both Subtitle C and C-Minus regulation could potentially pose a threat to the economic viability of affected domestic phosphoric acid producers, based on estimated compliance cost impacts; estimated impacts under the Subtitle D-Pius scenario are marginally lower. Because, however, all producers are expected to be affected, there is a greater potential for passing through costs to consumers in the form of higher prices for domestically produced acid than there would be if phosphogypsum were to be regulated as a hazardous waste. Eight of the 21 facilities managing potentially hazardous process wastewaters are predicted to incur significant impacts under the Subtitle D-Pius scenario. The significance of these impacts, as discussed above, is diminished by the possibility of the operators reducing waste generation or physically separating waste streams generated

from different operations, in order to dramatically reduce the actual volume of water that would be hazardous and hence require treatment.

12.7 Summary

As discussed in Chapter 2, EPA developed a step-wise process for considering the information collected in response to the RCRA \$8002(p) study factors. This process has enabled the Agency to condense the information presented in the previous six sections of this chapter into three basic categories. For each special waste, these categories address the following three major topics: (1) the potential for and documented danger to human health and the environment; (2) the need for and desirability of additional regulation; and (3) the costs and impacts of potential Subtitle C regulation.

Potential and Documented Danger to Human Health and the Environment

The intrinsic hazard of phosphogypsum is moderate to high in comparison to other mineral processing wastes studied in this report. Based on EP leach test results, 2 out of 28 samples (from 1 out of 8 facilities tested) contain chromium concentrations in excess of the EP toxicity regulatory levels. Chromium concentrations measured in SPLP (EPA Method 1312) leachate, however, were well below the EP regulatory levels. Phosphogypsum contains 12 constituents that exceed one or more of the screening criteria used in this analysis by more than a factor 10. Phosphogypsum solids may also contain uranium-238 and radium-226 in concentrations that could pose an unacceptably high radiation risk if the waste is allowed to be used in an unrestricted manner. For this reason, as part of its recently promulgated airborne emission standards for radionuclides (54 FR 51654, December 15, 1989), EPA has banned the off-site use or disposal of phosphogypsum in anything other than a stack or mine, with a limited waiver for agricultural uses. (See also 55 FR 13480, April 10, 1990.)

The intrinsic hazard of phosphoric acid process wastewater is relatively high compared to other mineral processing wastes studied in this report. Measurements of pH in 42 out of 68 process wastewater samples (from 10 of 14 facilities tested) indicated that the wastewater was corrosive, sometimes with pH values as extreme as 0.5. Based on EP leach test results, 19 out of 30 samples contain cadmium concentrations in excess of the EP toxicity regulatory level. In addition, 3 of 30 samples contain chromium concentrations in excess of EP toxicity regulatory levels. Phosphoric acid process wastewater also contains four constituents at concentrations that exceed one or more of the screening criteria used in this analysis by more than a factor of 1,000 and another 15 constituents exceed at least one relevant criterion by more than a factor of 10, including three radionuclides (i.e., gross alpha and beta radiation and radium-226).

Numerous documented cases of ground-water contamination indicate that phosphogypsum and process wastewater constituents have been released to ground and surface water at a number of facilities, and, at some sites, have migrated off-site to potable drinking water wells in concentrations that are well above criteria for the protection of human health. For example, in central Florida, the State Department of Environmental Regulation has initiated enforcement actions at all 11 active phosphoric acid production facilities because phosphogypsum stacks and process wastewater ponds have caused ground-water contamination above drinking water standards at the plant boundary or beyond. Based on the evidence of documented damages, EPA concludes that management of phosphogypsum and process wastewater in stacks and unlined ponds can release contaminants to the subsurface and that stack and dike failure can release contaminants to nearby surface waters. The combination of the intrinsic hazard of these wastes and the documented evidence of releases indicates that current management of phosphogypsum and phosphoric acid process wastewater may threaten human health through drinking water exposures, threaten aquatic life, and may render water resources unsuitable for potential consumptive uses. Although EPA estimates that phosphogypsum stacks pose an MEI lifetime air pathway cancer risk of as much as 9x10⁻⁵ as a result of radon emissions from the stacks, (with minor contributions from radioactive and nonradioactive constituents in windblown dust) the Agency

concluded in its analysis of NESHAPs for phosphogypsum stacks that this level of risk is "acceptable." ¹⁴² Consequently, EPA promulgated a work practice standard for radon flux from phosphogypsum stacks that the Agency belives existing stacks meet... without the need for additional control technology. ¹⁴³

Likelihood That Existing Risks/Impacts Will Continue in the Absence of Subtitle C Regulation

At many active phosphoric acid production plants, current waste management practices and environmental conditions may allow contaminant releases and risks in the future in the absence of Subtitle C regulation. For example, the stacks and ponds are typically unlined and in the Southeast, where the phosphoric acid industry is most heavily concentrated, and ground water occurs in relatively shallow aquifers. While these surficial aquifers are not typically used for drinking water purposes, they frequently are hydraulically connected to aquifers or surface waters that supply drinking water. Similarly, catastrophic stack and dike failures and long-term seepage from stacks and ponds have released process wastewater and phosphogypsum constituents directly from management units to surface waters. Therefore, environmental releases can occur and, considering the intrinsic hazard of the wastes, significant exposures could occur if contaminated ground water is used as a source of drinking water.

The phosphoric acid production industry recently has been recovering from low production levels in the mid-1980's and may continue to expand somewhat in the future if fertilizer use continues to grow in response to increases in crop prices and planted acreage. Increases in production would likely be provided by increased capacity utilization at active plants (e.g., in 1988 three plants operated at utilization rates of 16 to 38 percent) and the reactivation of plants that are presently on standby. Therefore, if phosphoric acid production does increase, use of existing waste management units (both those at facilities evaluated in this analysis and those at idle facilities that were not included in this analysis) would expand, potentially increasing release potential and posing greater threats to human health and the environment. However, given the large quantities of these wastes, and the ban of off-site use of phosphogypsum, ¹⁴⁴ it is unlikely that these wastes will be used or disposed in significant quantities at off-site locations in the future.

State regulation of phosphoric acid production wastes varies considerably among the seven states in which active plants are located, but requirements in most states may not be sufficient to control releases from existing units and prevent threats to human health and the environment. For example, relatively comprehensive solid waste regulations in Louisiana and Florida (under development) require liners and specify closure requirements for new and expansions of existing stacks, but the state programs provide controls for releases from existing units only through requirements for ground-water monitoring and performance standards that in some cases allow off-site contamination. In North Carolina, phosphogypsum and process wastewater are not defined as solid wastes, and are not subject to any solid waste regulations, though discharges from waste management units must be permitted under the state's EPA-approved NPDES program. In summary, state regulatory controls may not be sufficient to prevent releases of phosphogypsum and process wastewater constituents from existing units, and in only a few states are regulations that specify construction and operation standards in place or under development.

Costs and Impacts of Subtitle C Regulation

EPA has evaluated the costs and associated impacts of regulating both phosphogypsum and process wastewater from phosphoric acid production as hazardous wastes under RCRA Subtitle C. EPA's waste characterization data indicate that phosphogypsum exhibited the hazardous waste characteristic of EP toxicity at only one of the eight active facilities for which sampling data were available. EPA's data also indicate that

^{142 54} FR 51675. December 15, 1989.

¹⁴⁰ Did.

¹⁴⁴ Ibid.

process wastewater is either corrosive or EP toxic or both at each facility for which sampling data were available. Because of the relatively high potential for contamination as a result of the environmental settings of most phosphoric acid sites (e.g., shallow ground water) and the large number of damage cases associated with phosphoric acid production wastes, EPA employed the conservative assumption that phosphogypsum would be EP toxic at untested facilities, and that process wastewater would be both corrosive and EP toxic at untested facilities; the Agency's cost and impact estimates reflect this assumption and therefore probably overestimate the impacts of prospective regulation.

For phosphogypsum, costs of regulatory compliance under the full Subtitle C scenario exceed \$10 million annually at all affected facilities and range as high as \$185 million per year; these costs would impose potentially significant economic impacts on the operators of all affected plants. Application of the more flexible Subtitle C-Minus regulatory scenario would result in compliance costs that, on average, are approximately 60 percent lower, ranging from about \$1 million to more than \$65 million annually. Costs under the Subtitle D-Plus scenario are approximately 19 percent lower than under Subtitle C-Minus, because of further relaxation of waste management unit design and operating standards.

Subtitle C compliance costs would comprise a significant fraction of the value of shipments of and value added by phosphoric acid production operations at most affected facilities; ratios at seven of the eleven affected facilities exceed ten percent (five have ratios at or above 20 percent), while the remaining four exceed four percent. Compliance cost ratios under the Subtitle C-Minus and Subtitle D-Plus scenarios generally range from three to eight percent, though ratios at Agrico's Uncle Sam (LA) plant exceed eleven percent even under the least stringent scenario. EPA's economic impact analysis suggests that the domestic phosphoric acid industry is currently stronger than it has been in recent years, but would probably not be able to pass through compliance costs in the form of significantly higher prices to product consumers. Moreover, because not all domestic producers would be affected or affected equally, it is improbable that facilities experiencing high compliance costs would be able to obtain higher product prices in any case, given the relatively low rate of industry capacity utilization (77 percent overall in 1988). Therefore, if phosphogypsum were removed from the Mining Waste Exclusion, facilities at which this material was EP toxic might face new waste management costs (even under modified Subtitle C standards) that could threaten their long-term profitability and hence, their economic viability.

It is worthy of note that some impacts would be likely to occur even in the absence of a decision to remove phosphogypsum from the Mining Waste Exclusion, because adequately protective waste management standards under a Subtitle D program would require the construction of new waste management units at most facilities, implying significant new capital expenditures.

Based upon existing waste characterization data, EPA believes that all of the 21 facilities generating wet process phosphoric acid process wastewater might incur costs under a change in the regulatory status of this waste. Annualized regulatory compliance costs under Subtitle C would exceed \$225 million, ranging from \$4.7 to \$26.3 million. Annualized new capital expenditures would account for approximately 45 percent of the total, with the cost of wastewater tank treatment dominating overall costs. Under the Subtitle C-Minus and D-Plus scenarios, the annualized compliance costs drop only slightly (\$10-12 million in aggregate), due to relaxed technical standards for operation of the surge ponds used to hold the wastewater prior to treatment. The Agency expects that regulation of process wastewater as a hazardous waste under both Subtitle C and C-Minus regulation could potentially pose a threat to the economic visibility of affected domestic phosphoric acid producers, based on estimated compliance cost impacts; estimated impacts under the Subtitle D-Plus scenario are marginally lower. The significance of these impacts might be diminished by the possibility of the operators reducing waste generation or physically separating waste streams generated from different operations, in order to reduce the actual volume of water that would be hazardous and hence require treatment.

Finally, EPA believes that incentives for recycling or utilization of phosphoric acid production wastes would be mixed if a change in the regulatory status of this waste were to occur. The predominant management alternative to disposal of phosphogypsum has been off-site use in construction applications and in agriculture. Because of the recently promulgate NESHAP banning such use, however, EPA expects that phosphogypsum

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will now be disposed on-site, regardless of the RCRA requirements that may be applied to such disposal, i.e., regulation under Subtitle C would affect only the costs of phosphogypsum management, not the type(s) of management techniques employed. Direct recycling of phosphogypsum for additional product recovery is not a viable option, and process changes that might affect the chemical properties of the material as well as purification methods have been employed with variable success. It is likely that in response to new regulatory requirements, facility operators would develop and implement measures to render their phosphogypsum non-EP toxic. Process wastewater is currently internally recycled at all active facilities. The potential for reducing the amount of water used and/or significantly reducing the total quantities of corrosive or otherwise hazardous substances currently found in process wastewater is extremely limited, given the nature of wet process phosphoric acid production operations.

HYDROLOGIC IMPACTS OF PHOSPHATE GYPSUM DISPOSAL AREAS IN CENTRAL FLORIDA

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HYDROLOGIC IMPACTS OF PHOSPHATE GYPSUM DISPOSAL AREAS IN CENTRAL FLORIDA

1.0 INTRODUCTION

Large quantities of phosphate rock are mined and processed in Central Florida (Figure 1). The phosphate rock from the mines is further processed in "chemical plants" to produce phosphoric acid (Figure 2). A by-product of the processing of the phosphate rock to produce fertilizer chemicals is an impure form of gypsum referred to as phosphogypsum. For each ton of phosphate rock processed, approximately 1.5 tons of phosphogypsum is produced (Figure 3). The typical method to dispose of this by-product gypsum is to stack it in large piles, locally referred to as gypsum stacks or gypsum fields (Figure 4).

These gypsum stacks have been the focus of many studies in recent years in an attempt to identify the potential for ground water and/or air pollution associated with the stacks. This paper attempts to discuss some of the ground water impacts and current attempts to minimize these impacts.

2.0 BACKGROUND

Initially, phosphate chemical plants produced diamonium superphosphate and waste disposal was minimal. However, since the early 1920's and 1930's when chemical plants first began to clarify and upgrade the P205 content of the phosphoric; acid to produce triple superphosphate and diamonium phosphate, the quantities of waste gypsum to be disposed increased substantially. During this 30 to 40 year time period, vast

quantities have been stored in this manner. At present there are approximately 17 gypsum stacks/fields located in the central Florida phosphate district (Figure 5). These gypsum stacks are not unique to central Florida and are located throughout the United States. Anywhere phosphoric acid is produced, one of these stacks occur. Presently there are gypsum stacks in Louisiana, Mississippi, Missouri, Texas, North Carolina and in many of the western states. A few of these gypsum stacks are inactive, but most are presently being used.

3.0 GENERAL CHARACTERISTICS

As you would expect, most gypsum disposal stacks are located as close as possible or practical to the chemical plant in order to keep pumping costs to a minimum and often are located adjacent to the mining area (Figure 6 and 7). A typical gypsum stack is 400 to 600 acres in size and has an associated cooling water pond of approximately 250 acres in size (Figure 8). The gypsum slurry is transported from the chemical plant to the top of the stack using acidic process water. The gypsum slurry is deposited on the top of the stack, the gypsum settles out and the process water is reused (Figure 9). The process water used to transport the gypsum to the top of the stack is recirculated to the plant generally via the cooling water pond. This process/cooling water is acidic, containing sulfuric and phosphoric acid from the digestion of phosphate rock with sulfuric acid.

In most cases runoff from the side slopes of the stacks is collected in ditches surrounding the perimeter of the stacks.

The process water is returned to the chemical plant for reuse in unlined ditches or pipelines (Figure 10).

Typically once the stack reaches a height of 100 to 150 feet in height, another stack is started in a new location and/or the existing one is expanded (Figures 11 and 12). However, due to difficulties in obtaining permits, some stacks recently are proposed for heights of up to 200 feet (Figure 13).

In the past these plant facilities were generally located in areas away from population centers. However, in recent years, Florida has experienced unprecedented growth and areas which were once remote and removed from population centers are now being surrounded as the suburbs extend out from the cities.

In the late 70's and 80's our environmental awareness been reported ground-water pollution. increased by The environmental regulatory agencies have focused on gypsum stacks as a potential pollution source. As a consequence of this interest in gypsum stacks, numerous studies have been conducted in the recent past. These studies have been commissioned various industry and regulatory interest such as the Florida Phosphate Council, Florida Institute of Phosphate Research (FIPR), the Florida Department of Environmental Regulation (FDER), the U.S. Environmental Protection Agency (EPA) and the operating companies pursuit of permits for various in construction or operation of new and existing facilities.

4.0 HYDROLOGIC SETTING IN THE CENTRAL FLORIDA AREA

The upper surficial aquifer and the floridan aquifer are the principal ground water sources in central Florida (Figure 14). In most instances these two aquifers are separated by a confining bed which may have an intermediate aquifer system. Underlying the lower Floridan aquifer is another confining bed. The upper surficial or water table aquifer is principally composed of sand, clayey sands and in some areas shell and gravel beds.

The Floridan aquifer consists principally of porous limestones. The confining units are generally sandy or silty clays, clays and marls; and/or dense limestones and dolomites or dolosilts.

The surficial aquifer is unconfined and rises or falls in response to rainfall and discharges to streams and underlying aquifers. The water level of the surficial aquifer lies below the land surface generally from about 4 to 10 feet in the area of most of the gypsum stacks.

The water in the Floridan aquifer is generally confined. Recharge to the Floridan aquifer is principally by lateral flow, leakage through confining beds and recharge in Karst regions of Florida (Figure 15). Fortunately, most gypsum stacks are located in an area of low recharge to the Floridan aquifer. The general natural flow of ground water in the central Florida phosphate district is southwestward toward the Gulf of Mexico (Figure 16). Since about 1975 the U.S. Geological Survey (USGS) has monitored and mapped the wet and dry season potentiometric level of the

Floridan aquifer. During the winter months agricultural pumpage in south central Florida can reverse the discharge flow (Figure 17).

The sandy surficial sediments which comprise the water table (surficial) aguifer are typically 5 to 50 feet in thickness (Figure 18). These surficial sediments are underlain by 20 to 80 feet of inner-bedded phosphatic, sandy, shelly, clayey, marley sediments that comprise the Pliocene Bone Valley formation. Miocene Age Hawthorn Formation underlies the Bone Valley Formation. The Hawthorn is an impure marine dolomitic limestone which contains varying concentrations of phosphate and quartz sands, clay, marl and dolomite and ranges in thickness to upwards of 100 feet. In many areas the lower portion is an intermediate aguifer producing zone. Underlying the Hawthorn is the Miocene Tampa Formation. The Tampa is similar to the Hawthorn but contains less dolomite and has more clay beds. The Tampa ranges from a few feet in thicknesses to upwards of a 100 feet thick. Portions of the upper Tampa and lower Hawthorn formations are the principal intermediate aquifer systems. Underlying the Tampa is a thick sequence of Oligocene to Eocene aged limestones. limestones are hundreds of feet in thickness and comprise the principal Floridan aquifer. Granular evaporites generally underlie the Floridan aquifer.

5.0 RESULTS OF PREVIOUS STUDIES

The most widely published and easily available studies for review are those which were conducted by the USGS beginning in late 1978 and published in 1984. The data were initially published in 1982 and the evaluation of the data being made available approximately 2 years later. As a result of monitoring the ground water around these stacks, FDER has noted ground water violations at many sites as noted in Table 1 and Figure 19.

Recently the USEPA has distributed a Preliminary Draft EIS Supplement to the Central Florida Phosphate area wide EIS. This preliminary draft EIS addresses gypsum disposal systems.

Most studies including the USEPA Draft EIS have indicated that the surficial ground water impacts are generally restrained to an area within 500 to 1500 feet of the gypsum stack (Figures 20, 21 and Table 2). In some cases the intermediate aquifer has been slightly impacted.

6.0 WATER CHARACTERISTICS

The processed water from the chemical plants which is used to slurry the gypsum to the disposal area is highly acidic (ph of 1.4 to 1.8) and has a high dissolved-solids concentration at about 28,000 parts per million (ppm). The predominant contaminants are sodium, phosphate, fluosilicates, hydrogen and sulfate (Table 3).

Native ground water has a dissolved-solids concentration of approximately 500 parts per million with a ph which is generally less than 7.0.

Migration of radionuclides, fluosilicates, phosphates and trace metals are easily percipitated as the acid is neutralized by the carbonate in aquifer fabrics.

Recent monitoring data for some operating plants indicates the chemical front is slowly creeping out from the field as the "carrying or absorptive properties" of the aquifer fabric is reached. As a result of the increasing chemical fronts, regulatory agency personnel are putting increasing pressure on the operators to contain/prevent the leaking of process water from the gypsum stacks.

7.0 APPROACHES TO DEAL WITH THE POTENTIAL FOR GROUND WATER CONTAMINATION IN GYPSUM DISPOSAL FIELDS

In the past, the gypsum disposal fields were constructed either on natural unmined land or in many cases they were constructed directly in the mined lands associated with the phosphate mining process. This meant that the gypsum was

deposited directly upon the existing land surface or on the top of the Hawthorn Formation (Figure 22). However, during the past 10 to 15 years, several approaches have been taken to locate the stacks in areas which would alleviate the potential for ground water contamination or to construct the stacks in such a way as to reduce or eliminate the potential for ground water contamination. Initially, to protect the surface water ditches were dug around the stacks to collect the runoff and seepage from the side slopes of the stacks. This was effective to collect the surface water runoff from the gypsum disposal areas.

In the early 80's attempts were made to site stacks in areas where naturally occurring thick clays could be used as a natural liner (Figure 23). In some areas of the central Florida district, the Hawthorn Formation is very impermeable and is quite thick. In the early 80's USS Agri-Chemicals used a modification of this approach in an area where the Hawthorn was very impermeable and waste clays existed (Figure 24). In addition, a ditch was dug around the stack to prevent lateral migration of leachate (Figure 25). However the water level in the ditch had to be carefully controlled to prevent migration of contaminated ground water from the stack into the surrounding surficial aquifer.

In the mid 80's Gardinier proposed an extensive system consisting of a compacted clay liner and underdrains overlying a thick sequence (15-20') of naturally occurring Hawthorn clays in their permit application for a new gypsum stack. This was a very elaborate system of underdrains, liners, slurry walls, etc.

(Figures 26, 27 and 28). Due to the Gardinier Chemical Plant's location on the Tampa Bay and proximity to nearby population centers, these measures were required to insure that the stack would be permitted and that the ground water would be protected. More recently, IMC Fertilizer (IMCF) has proposed to construct a new gypsum disposal stack. Initially IMCF proposed more conventional stack construction techniques where the stack would be built directly upon the Hawthorn formation in a mined out Recently, due to increasing pressure from the regulatory agencies they have revised their plans and proposed to install a synthetic liner beneath the stack and a slurry cutoff wall along portions of the cooling water pond (Figures 29, 30 and 31). FDER is presently considering that all new gypsum stacks constructed in Florida will require a liner to protect the ground water.

8.0 SUMMARY

In summary, recent studies have indicated that there are some potential ground water impacts associated with phosphogypsum disposal areas in Florida. Most of these studies have indicated that the lateral ground water impacts to the surficial aquifer system extend beyond the existing non-lined gypsum disposal stacks for a distance of approximately 1500 feet. In some cases contamination has been reported in the intermediate aquifer system. The various regulatory agencies including USEPA, FDER and various state and local governments have continued to increase the pressure for permit applicants to design gypsum

stacks which will protect the groundwaters of the state. In the past ten (10) years gypsum stacks have been designed and sited so as to use the natural confining layers and buffering sediments which occur in Florida; designed artificial compacted clay liners and slurry walls; and more recently recommended synthetic membranes overlying the natural confining carbonate sediments to mitigate and control the leachate from gypsum disposal systems. The proposed phosphate area wide draft EIS is proposing even more stringent conditions upon siting of gypsum disposal fields and recommending closure procedures for existing stacks. The results of ground water monitoring for these newly proposed stacks once constructed will be used to determine the next generation of controls and constraints which will be applied to gypsum stack permit conditions.

TMG\GYPSUM.PPR

TABLE 1
REGULATORY STATUS OF PHOSPHOGYPSUM STACKS

			INTERMED FLORIDAN		SURFICIAL	. AQUIFER	ENFORCEMENT		EXPANSIO APPLI	N PERMIT	EXTENDED
FACILITY NAME	ACTIVE	INACTIVE	PRIMARY AND SECONDARY MOLATION	SECONDARY MOLATIONS ONLY	PRIMARY AND SECONDARY VIOLATION	SECONDARY MOLATIONS ONLY	ACTION INITIATED	WELLS WITHIN 1/2 MILE	ISSUED	WITHDRAWN	ZONE OF DISCHARGE
C.F. INDUSTRIES	x				x		x				
CENTRAL PHOSPHATES	x _		x		x		x	x		x	
CONSERVE	x				x		X	x			
FARMLAND INDUSTRIES	x				x		x	x			
GARDINIER	x						х				
AGRICO CHEMICAL	X				X		x				×
AMERICAN CYNAMID		x			x						
IMC NEW WALES	x		x								
ROYSTER, PINEY POINT	x				x						
SEMINOLE FERTILIZER	x		х		x		x	x			
USSAC, BARTOW		x			, x			×			
USSAC, FORT MEADE	х					x		x			
ESTECH		x			x						
IMC P-21		x				×					
ROYSTER, MULBERRY	x					x			X		

SOURCE: USEPA DRAFT CENTRAL FLORIDA PHOSPHATE AREA MDE EIS SUPPLEMENT.

DRWG: CFRP9CHT

	Drinking	Limitation			proximate ince Distance	
Constituent	Water Standards	mg/l	Royster	WR Grace	Conserv	USSAC
Silver (Ag)	Primary	0.05	50 ^a c	100 ^a	80 ^a ,	50 ^a
Arsenic (As)	Primary	0.05	200, [£]	300 ^f	500 ^b ,	800°
Chromium (Cr)	Primary	0.05	300 ^b	600 ^e	120pb	400 ^f
Cadmium (Cd)	Primary	0.01	200 ¹	600 ^e	850 ^b	1050 ^C
Lead (Pb)	Primary	0.05	50 ^a	100 ^a	300 ^e	1050 ^c 50 ^a
Fluoride (F)	Primary	1.6	50 ^a	100 ^a	80 ^a	
Selenium (Se)	Primary	0.01	• 50 ^a _	100 ^a ,	80 ^a ,	50 ^a
Iron (Fe)	Secondary	0.3	100Q ¹	600 ^d	580 ^d	1800 ^e
Sulfate (SO,)	Secondary	250	800 ¹ ₅	600 ^d	580 ^d	1800 ^e
Total Dissolved	Secondary	500	1000 ¹	600 ^a	580 ^d	1800 ^e
Solid (TDS)	·		_		•	
Manganese (Mn)	Secondary	0.05	1100 ^e	600 ^d	580 ^d	1800 ^e

^aConcentration below DWS within given distance

Source: USEPA Draft Phosphate Areawide EIS Supplement

^bDistance determined by applying linear regression to all downgradient wells

^CDistance determined by applying linear interpolation between downgradient wells

dElevated concentration above DWS at most distant monitoring well

eConcentration slightly above DWS and probably exceeds beyond given distance

f Distance estimated using water quality data and distribution of monitoring wells

Insufficient data

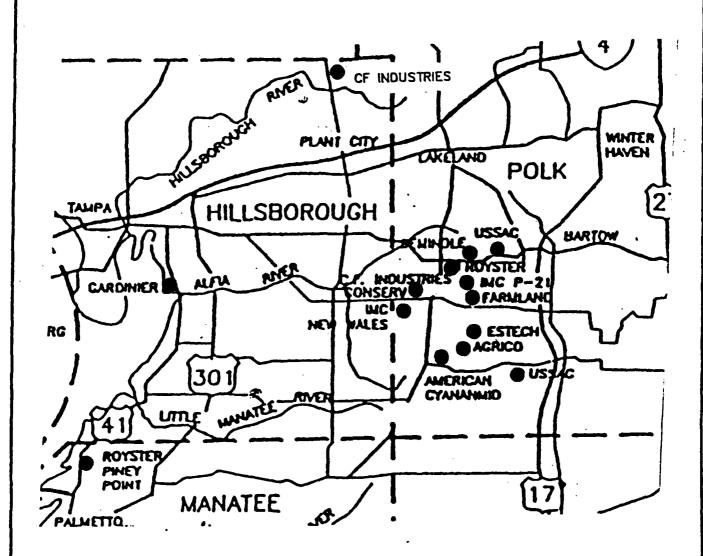
TABLE- 3 CHEMICAL AND RADIOLOGICAL COMPOSITION OF TYPICAL PHOSPHATE CHEMICAL PLANT POND WATER

		MCL_	Pond to	/ater
_	MISCELLANEOUS PARAMETERS			
•	MESCELLANEOUS FARAMETERS			
	Sampling Date		04-03-87	09-18-87
	рН	>6.5	1.4	1.6
	Specific Conductance, umhos/cm	n3	26,700	32,000
	Color, cobalt units	15	1,000	×
	Odor, TON	3	40	×
	Turbidity, NTU Corrosivity, Langeller Index	1 -0.2 to +0.2	29.5	. x
	Surfactant, mg/l LAS	0.5	-7.6 <0.05	x
	Acidity, as CaCO ₂	ns	40,000	36,650
	Total Hardness, as CaCO3	8.5	3,621	×
•	MAJOR CONSTITUENTS (mg/l)			
	Total Dissolved Solids	500	38,350	43,293
	Sulfate, SO4	250	5,728	4,216
	Fluoride, F	4.0	9,400 .	9,000
	Orthophosphate, PO4 as P	RS	6,500	6,900
	Chloride, Cl	250	118	. 159
	lodide, I Sulfide, S	ns · ns	18.8 0.08	×
			0.00	×
	Nitrogen Nitrate, NO ₁ as N	10.Ò	<0.10	` x
	Organic, as N	0.5	77	Ŷ
	Ammonia, NH ₄ as N	ns	1,421	1,108
	Calcium, Ca	กร	1,248	- 1,076
	Magnesium, Mg	ns	279	300
	Potassium, K	R4	292	315
	Sodium, Ne	160	2,020	2,710
	Silica, SiO ₂	n.s	4,452	5,318
•	TRACE METALS (mg/l)	•		
	Aluminum, Al	ns	728	273
	Antimony, So	0.5	1.56	×
	Arsenic, As	0.05	0,12 0,6	0.33
	Barium, Ba Beryllium, Ba	1.0 ns	0.10	x
	Cadmium, Cd	0.010	0.41	x
	Copper, Cu	1.0	0.28	. ×
	Chromium, Cr	0.05	1,52	×
	Cyanide, CN	. A3	<0.005	X.
	Iron, Fe	0.3	190.3	. 252
	Lead, Po	0.05 0.05	0.15 11.4	×
	Mercury, Hg	0.002	<0.0002	x
	Nickel, Ni	ns	1.40	×
	Selenium, Se	0.01	0.006	. x
	Silver, Ag	0.05	0.06	0,06
	Thellium, TI	ns	0.63	×
	Zinc, Za	5.0	4.79	x
•	ORGANIC COMPOUNDS (mg/D			
	Total Organic Carbon, TOC	វាន	200	×
	Phenol	ns 0.10	0.16	x
	Total Tribalomethane, TTHM	0.10	<0.004	×
•	RADIONUCLIDES (pCI/I)			
	Gross Alpha Particle Activity	15	2,582-568	×
	Radium 226	S(Combined)	67.9 [±] 10.2 2.1 [±] 0.3	*
	Radium 228		2,1-0.3	ĸ

x: Parameter not measured.

ns: Not specified.
MCL: Section 17-22,210 and 17-22,220 FAC Maximum Contaminant Level.

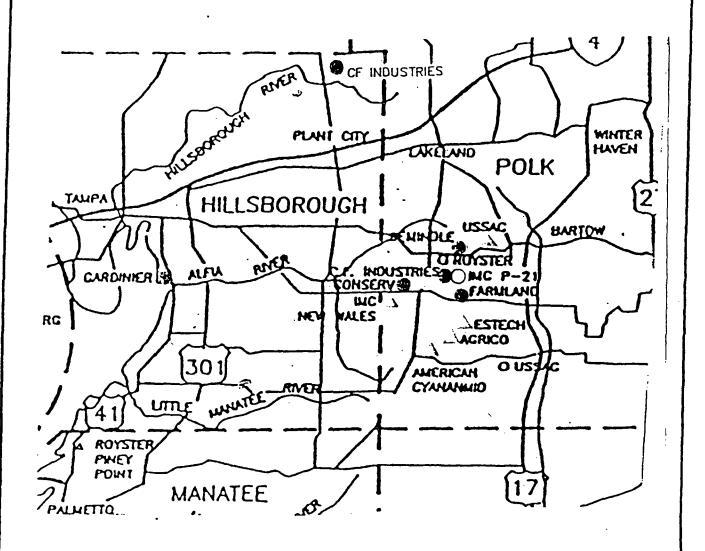
FIGURE 5 LOCATION OF CHEMICAL PLANTS AND GYPSUM STACKS IN THE CENTRAL FLORIDA PHOSPHATE DISTRICT



FACILITY LOCATION

DRWG: CFRP9LCP

FIGURE 19 REGULATORY STATUS OF GYPSUM STACKS IN CENTRAL FLORIDA PHOSPHATE DISTRICT



- O NO CURRENT GROUNDWATER VIOLATIONS
 - PRIMARY STANDARD VIOLATIONS AT THE PROPERTY BOUNDARY OR IN THE INTERMEDIATE / FLORIDAN AQUIFER
- UNDER INFORCEMENT FOR GROUNDWATER OR SURFACE WATER VIOLATIONS

KIRK-OTHMER

ENCYCLOPEDIA OF CHEMICAL TECHNOLOGY

THIRD EDITION

VOLUME 10

FERROELECTRICS
TO
FLUORINE COMPOUNDS, ORGANIC

A WILEY-INTERSCIENCE PUBLICATION

John Wiley & Sons

NEW YORK • CHICHESTER • BRISBANE • TORONTO

ntional cold-mix is for the future, ents.

ecently by Agrico e phosphate raw ng disintegration evel of 1-2 wt %. added. Costs of ghtly lower than i-0.25/kg of plant

and ammonia are ategration of the 16-8-8, 12-12-12,

te, granular ATP rred as the phoswhich stores well most orthophosscheduling. Less rial because the anules.

hate suspension.
and anhydrous
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ng of the solution
nent in the thirdof crystals in the
nixed with ureaproduce various

10sphate 13-38-0

chout which susment for storing,

ould be equipped ervals of one day

perforated pipe used to circulate inloading. Other

dcast applicators to 0.7 hm²/min. rgest applicators

Table 13. Estimated Price of 13-38-0 Ammonium Phosphate Suspension Produced in a New (1978^a) Florida-Gulf Coast Plant

	Units/t product	Cost, \$/unit	Cost, \$/t 13-38-0
raw materials ^b			
anhydrous ammonia, t	0.145	109.45	15.87
wet-process phosphoric acid (54%), t	0.635	185.15	117.57
water, process, L	257,800	38,800	0.01
clay, t	0.014	60.00	0.84
pperating costs			6.49
capital charges, 34% of capital investment			6.68
sales and administrative costs, 10% of sales			16.38
Estimated price			163.84

^a Plant completed February 1978 Florida-Gulf Coast area. Capacity: 720 t/d; 237,600 t/yr. Capital investment: \$4,718,000 grass roots (includes battery limits plant, 90-d product storage, site purchase and preparation, and support facilities. Working capital (30-d value of raw materials plus 90-d value of raw materials and operating costs): \$12,023,000. Courtesy of TVA.

h Raw materials purchased (fob Tampa).

The speed and reliability of application of suspensions by such modern equipment are unmatched by any other fertilizer application system.

Environmental Aspects of Fertilizer Production and Use

The potential for pollution of air and water is inherent in the production and use of fertilizers. Legislation to protect and preserve the environment and to protect workers in industrial plants is implemented in the United States by the EPA and the Department of Labor, respectively. There is a worldwide trend toward increased regulation of pollution (126). United States technology and regulations are taken as the principal basis for this discussion, with occasional reference to differing practices in other countries (see Air pollution; Air pollution control methods; Water pollution).

Of the six major industrial air pollutants deemed injurious to human health, three are directly involved in fertilizer manufacture: sulfur oxides (from sulfuric acid production), nitrogen oxides (from nitric acid and ammonium nitrate production), and particulates. National primary and secondary ambient air quality standards for these are shown in Table 14.

There are in addition designated or noncriteria pollutants which, although not shown to impair human health, may damage the environment. Controls for these are at various stages of development and implementation. Fluorides emitted in phosphate fertilizer manufacture have been designated and standards of performance issued in 1975 (127).

The goal of aqueous effluent guidelines is zero pollutant discharge by 1985: this was accelerated to 1977 for mixed and blend fertilizer processes and for ammonium sulfate production.

In addition to ambient air quality standards and emission standards, fertilizer manufacturers are required to control the environment in the working area in accor-

^c Includes insurance and taxes—3%, depreciation, 6.67%, interest—8% on one half of capital investment, and pretax return on investment—20% of capital investment.

	Prima	ry standard ^a	Secondary standard ^b	
Pollutant	Time period	Concentration, g/m ³	Time period	Concentration, g/m ³
sulfur oxides	annual average	80		
	24-h average	365		
	J		3-h average	
nitrogen oxides	annual average	100	same	as primary
particulate matter	annual average	75	annual average	60°
	24-h average	260 ^d	24-h average	150 ^d

To protect human health.

dance with OSHA regulations. Table 15 gives OSHA standards for air contaminants associated with fertilizer manufacture.

The fertilizer industry is moving ahead on pollution control. Capital investment per year for control equipment in the United States fertilizer industry alone increased from 10.3 million dollars in 1972 to 99.7 million dollars in 1976 (126) while operating costs for pollution control for basic fertilizer producers and integrated companies more than quadrupled in that period, rising from 9.7 million dollars to an estimated 44 million dollars. Capital expenditures are expected to decline as much of the equipment to meet current air and water deadlines is now installed. The capital cost for environmental controls at fertilizer plants is 5–6% of total investment. The Fertilizer Institute estimated the operating costs of environmental control in United States fertilizer plants in 1976 to be about \$3.30/t N and P_2O_5 .

Table 15. Industrial Hygiene Threshold Limit Values for Fertilizer Manufacture

Fertilizer material	Threshold limit values ^a , mg/m³ (ppm)
ammonia	356 (506)
fluoride (as F)	2.5
HF	2 (3)
H ₃ PO₄	1
co	55 (50)
H ₂ SO ₄	1
SO ₂	13 (5)
HNO ₃	5 (2)
NO ₂	9 (5)
dusts	
silica	10
nuisance or inert, total	15
respirable	0.5
noise (8-h)	90 dBc

^a 8-h time-weighted average value.

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^b To protect human beings and the environment.

^c Nonenforceable guideline.

^d Not to be exceeded more than once per year.

^b Values probably will be lowered to 18 mg/m³ and 25 ppm, respectively.

^c Higher noise levels are permitted when exposure times are less than 8 h daily.

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The technology for control of pollution at fertilizer plants is generally available, although further improvements may be expected in some areas. Under present conditions in the United States, large amounts of solid wastes—gypsum from wet-process phosphoric acid plants, sediments produced in the treatment of gypsum pond waters for discharge, and low-grade phosphate rock refuse (slimes from beneficiation plants)—must be stored. This storage of solid wastes, and the air emissions from gypsum ponds, represent the major remaining unsolved environmental problems for the industry. Under suitable economic conditions, not now existent in the United States, gypsum waste could be converted to useful products.

Pollution of groundwater and streams by fertilizer plant nutrients has caused some concern but there is strong evidence that, with caution in its use, fertilizer supplying the needed nutrients can be applied without risk of serious pollution in

nearly all instances. Precautions, of course, are in order.

Air Pollution Control in Fertilizer Production. The EPA has identified fifteen major fertilizer processes as potential polluters. Standards for five categories of fluoride-emitting processes have been promulgated (127). Standards for particulate emission from phosphate rock, urea, and ammonium nitrate operations are under review and currently are under state regulation, as are those for other fertilizer process operations. Regulations as of 1977, and methods for controlling, are summarized briefly below.

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Nitric Acid Plants. The allowable limit for NO_x (as NO_2) is 1.5 kg/t of HNO_3 produced (max 2-h av); opacity 10%. Methods developed for control of NO_x emissions include thermal and catalytic reduction with hydrocarbons or ammonia (see Exhaust control, industrial), reaction with urea, extended absorption, and adsorption on molecular sieves (qv). The most suitable method depends on type and size of plant and the uses to be made of the acid. All of these methods can meet or exceed EPA standards for new plants. Costs range from about 1% of production cost to net savings of \$0.15/t of acid (128).

Sulfuric Acid Plants. The allowable limit for SO_2 is 2 kg/t of H_2SO_4 produced (max 2-h av); acid mist, 0.075 kg H_2SO_4 /t H_2SO_4 produced (max 2-h av); and opacity, 10%.

The most advanced control technology for sulfuric acid (qv) plants involves double contact or double absorption (DL/DA). This extended catalytic control and absorption achieves 99.7% recovery of sulfur oxides, compared to 97–98% with single absorption. Extended absorption is now standard for most new plants. Stack gas from such plants contains 200–300 ppm of SO₂. In January, 1976, a new 1814 t/d sulfur-burning DL/DA acid plant cost approximately \$16,000,000, some 10% more than a single-absorption plant.

Ammonia scrubbing is still used in some acid plants for SO₂ control. Overall economics depend on recoveries and ammonia costs. Old sulfuric and nitric acid plants are under state regulation and may be allowed somewhat higher emissions when it can be demonstrated that the concentrations of NO₂ or SO₂ in the ambient air resulting from the emission are well below the ambient standard (see Sulfur recovery).

Fluorides. Fluoride, a pollutant from several fertilizer operations, can be recovered in useful forms where the market and economic demands can be met. Whether the material is to be recovered or discharged determines the scrubbing process used for its removal. Fluorosilicic acid can be used in water fluoridation and to manufacture aluminum fluoride, synthetic cryolite, and hydrogen fluoride. The markets for these materials, however, are so uncertain that increased use of this by-product is not expected in the near-term future.

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Scale formation in scrubbers for fluoride control can be a problem. For this reason spray-chamber scrubbers with little or no packing are often used. These may be either vertical or horizontal. Scrubbers tend to be more efficient than can be projected from the apparent effluent composition, the fluoride vapor pressure data available for scrubber design is apparently inapplicable.

EPA (129) estimated that costs for control of fluoride emissions under the proposed standards would be less than 1% of the 1975 wholesale price for wet-process acid, superphosphoric acid, and diammonium phosphate. Estimated costs for control of fluoride for run-of-pile triple superphosphate was about 2% of 1975 sale price, and for granular triple superphosphate, 4%.

The standards and the best methods for control of the six fluoride emitters are summarized below.

Wet-Process Phosphoric Acid Plants. No more than 10 g total fluoride per metric ton of equivalent P_2O_5 input to the process is allowed. The best demonstrated emission control consists of scrubbing offgas with gypsum pond water for removal of 98–99% of fluorides.

Gypsum ponds, devices used more extensively in the United States than elsewhere, are possibly the industry's greatest emitter of fluorides. Estimates of fluoride emitted are 0.03–0.92 kg/(hm²-d). Because there is no accepted technology for measuring or controlling fluoride emissions from the ponds, standards for these are not expected in the near future. The only way known to prevent fluoride emission from gypsum ponds is by precipitating the fluoride with lime. Liming of entire gypsum ponds is impractical.

Superphosphoric Acid Plants. No more than 5.0 g total fluoride per metric ton of equivalent P_2O_5 input to the process is allowed. In the vacuum-evaporator process the fluorides are absorbed by water in the barometric condenser and no further control device is required. For the submerged-combustion process, packed scrubbers are considered the best available system for emission reduction.

Diammonium Phosphate Plants. No more than 30 g total fluorides per metric ton of equivalent P_2O_5 input to the process for new plants is allowed. Fluorides are removed by secondary scrubbing. Best results are obtained with a spray crossflow packed-bed scrubber. The best demonstrated control for ammonia consists of scrubbing emissions with phosphoric acid solution.

Run-of-Pile Triple Superphosphate Plants. No more than 100 g of total fluoride per metric ton of equivalent P_2O_5 input is allowed. The best demonstrated control of fluoride consists of scrubbing emissions with water. No visible emission is observed from storage facilities with this type of control.

Granular Triple Superphosphate Plants. No more than 100 g of total fluoride per metric ton of P_2O_5 input to the process is allowed. The best demonstrated control consists of scrubbing offgas with water.

Granular Triple Superphosphate Storage. No more than 0.25 g/h of total fluoride per ton of equivalent P_2O_5 in storage is allowed. The best demonstrated control of fluorides consists of scrubbing emissions with water.

Phosphate Rock Processing. Although federal standards for the various operations in phosphate rock processing were still under development in 1977, states have imposed regulations (130) relating allowable emissions to the hourly tonnage of material processed.

Nearly all the phosphate rock mined contains enough moisture so that dust

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Nitrogen Plant Control Technology. Ammonia Plants. Effluent guidelines for ammonia plants are shown in Table 16. Because condensate from ammonia plants contains 800–1100 ppm of ammonia and substantial amounts of methanol and carbon dioxide, it cannot be released to streams without treatment. Condensate is steam stripped to remove 90–95% of the ammonia to meet effluent guidelines, with the volatile contaminants discharged to the atmosphere. The trend in modern plants is toward complete abatement of air and stream pollution and reuse of condensate. Raw water treating cost would thus be reduced. Current research is directed toward this end.

Urea Plants. A 1000 t/d urea plant produces 290–375 L/min of condensate, the amount depending on type of plant. The condensate contains from 2-6% NH $_3$ and 0.3–0.5% urea. These contaminants can be largely removed by a combination of urea hydrolysis and ammonia stripping.

The cooling water from urea plants is too warm (43.3°C) for release into streams. Cooling towers can alleviate this problem but these are expensive. Such warm water can often be used to advantage in evaporative scrubbing operations where the heat is dissipated in evaporating water. This is done in some urea and ammonium nitrate plants.

Ammonium Nitrate Plants. Evaporative scrubbing and water handling methods in ammonium nitrate plants are similar to those used in urea plants. The possibilities for this are expanded when the ammonium nitrate or urea plants are part of a complex involving nitric acid production and neutralization and the production of both explosive and fertilizer grades of ammonium nitrate.

An ion-exchange process has been used successfully to treat waste streams ranging in solute concentration from 1,700 to 11,000 ppm (146). The process uses a classical demineralization system.

After credit is taken for recovered ammonium nitrate and demineralized water, the operating cost is \$0.55–0.77/t of ammonium nitrate, ca 0.5% of the value of a metric ton of ammonium nitrate.

Potash Production. The high water solubility of most minerals encountered in potash mining sometimes leads to environmental problems in disposing of tailings and waste solutions. Mines located in arid regions, as in New Mexico, have few problems because there is little rainfall and evaporation rates are high. In areas of high rainfall, seepage from tailing piles is collected and returned to the process. Solutions are disposed of either by evaporating to dryness in the plant or in ponds, or by injection into porous underground strata (21). In the UK, tailings often are discharged into the sea.

Solid Wastes. Gypsum. In the United States and in some other countries, most of this by-product gypsum is disposed of as solid waste. A limited amount is used to treat saline soils in the western United States, mainly in California. Some is disposed of in rivers and in the ocean but this practice in the U.S. and in some other countries is being phased out for environmental reasons. Sea disposal is still permitted in Europe provided accumulation in estuaries is avoided. The most widespread practice is to stack the material near the production plant. For each daily metric ton of P_2O_5 produced, the land required for gypsum stacks is 1357 m³ (1.1 acre-ft)/yr—27.14 × 106 m³ (22,000 acre-ft) for a 20-yr life of a 1000 t/d (P_2O_5) plant. The urgent need to find other means for disposal or use for by-product gypsum is obvious.

A variety of processes have been developed for recovering sulfuric acid from gypsum and for using gypsum in cement production but neither practice is widespread for economic reasons.

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The production of sludge by liming or gypsum pond water has already been discussed; the sludge produced is another solid waste. The sludge volume is 50–60% of the volume of pond water treated. This sludge, a mixture of complex compounds of phosphates and fluorides, is disposed of on the gypsum stacks, further compounding the problem of gypsum disposal.

Phosphate Mining and Beneficiation. Increasing water demand in Florida, falling groundwater levels, mounting water quality problems, development of shorelands, decline of esthetic quality, and disorderly developments have combined to bring about more extensive planning and reclamation legislation in Florida than in any other state. This was essential in Polk County where nearly one third of the world supply of phosphate rock was produced in 1975. In Florida, mining plans and reclamation standards must be submitted for approval by a board of commissioners before new mining activities can begin. The mining company's environmental impact statement must provide means for and guarantee of reclamation of the mineral land and must describe how the reclamation will be accomplished. Reclamation and water protection regulations are also strong in North Carolina.

There is great concern among phosphate producers in the western United States that legislation will be passed requiring all mined areas to be completely restored to their original condition. Because of the nature of the terrain in that region, such restoration would be impossible, although useful restoration is possible. The passage of such legislation could preclude use of the largest phosphate resource in the United States.

Slime ponds. The water pollution aspect of phosphate slimes has already been mentioned. The slimes, containing 3.0–3.5% solids, are put into 160–240 hm² ponds where the solids settle over decades. There is 20,240 hm² of slime ponds in Florida alone. Occasional breaking of pond dikes has caused serious pollution of streams, with extensive fish kills. Research is in progress to find ways to improve phosphate recovery and lower the impact of slime deposits on the environment (147).

Radioactivity. Solid wastes, slimes, and tailings from phosphate rock beneficiation contain small amounts of radioactivity; some slimes contain fifty times the amount of radioactivity of typical soils of the United States (148).

The radioactivity of reclaimed phosphate lands sometimes is enough to cause exposures slightly greater than the present federal guidelines for maximum exposure of uranium miners. Guidelines for disposal of such radioactive wastes have not yet been developed.

Other Solid Wastes. There are several other minor solid wastes in fertilizer production. In ammonia plants using potassium carbonate for carbon dioxide removal, a small amount of arsenic oxide (As_2O_3) sludge is produced. A 1000 t/d plant produces about 20 t/yr of sludge containing 20% As_2O_3 . The sludge is either stored for special treatment in the plant or is shipped to an arsenic producer for recovery.

Sulfuric acid plants that burn sulfur produce about 0.3 kg of a sludge from filtering molten sulfur per t of H_2SO_4 produced. This sludge is usually dumped on slag piles where it sometimes ignites and results in atmospheric pollution.

Some European liquid-fertilizer producers accumulate a sludge (4-20 kg/t of liquid fertilizer) containing phosphates and fluorides together with the sawdust filter aid. Usually this is recovered and added to solid fertilizers.

Fertilizer bags containing small amounts of residual fertilizer constitute a significant waste disposal problem. These can be burned, provided they are not excessively contaminated, or they can be disposed of in land fill.

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116 FERTILIZERS

Environmental Implications of Inorganic and Organic Fertilizer Use. Surface and groundwaters receive pollutants from a wide variety of sources, including fertilizers applied to soils. With the increasing use of fertilizer, there is a tendency to regard them as a major source of pollution. The situation is complex, however, and when used properly commercial fertilizers may be only minor contributors to pollution. The subject is under intensive study in search of the facts, and means for control where needed (149–150).

According to the EPA, United States waters are improving with respect to coliform bacteria and oxygen demand, but the concentrations of nitrogen and phosphorus are increasing, largely from agricultural runoff and sewage. Most United States surface waters contain at least 0.3 ppm of N and 10 ppb of P. In terms of the level of nutrients required for control of algae growth (<0.3 ppm of nitrogen and <10 ppb of phosphorus), most United States surface waters are polluted, the concentration of nitrogen and phosphorus nearly always exceeds these amounts. Rainwater contains on the average 0.7–1 ppm of nitrogen.

Fertilizer nitrogen is removed from soil by plants, surface runoff, leaching and erosion. The main factors involved in phosphorus removal are crop uptake and erosion; leaching is significant only in highly siliceous sands and organic soils.

High values of NO₃-N in drinking water may cause methemoglobinemia in very young infants but the critical level is not well defined. The United States federal standard is 10 ppm but the California standard is 20 ppm. Animals too may be adversely affected by excessive concentrations of NO₃-N in drinking water.

It should be noted that surface and groundwater receive plant nutrients from many sources other than the fertilizer used in agriculture. Other major sources from agriculture include decaying plant matter, soil erosion (ca 3×10^9 t of sediment/yr in the United States carrying ca 1.8×10^6 of total phosphorus), animal and other livestock wastes. Manufactured fertilizer usually is not the major source of nutrients. For example, some 90×10^6 t/yr of nitrogen worldwide is fixed by biological and other natural means (151), compared to about 42×10^6 t of N in manufactured fertilizer used in 1975.

Storage and soil disposal of animal and poultry wastes and disposal of municipal sewage are very serious sources of pollution and are receiving major efforts toward control.

Nitrogen. Ammonium nitrogen from whatever source (anhydrous ammonia, inorganic salts, urea, controlled-release fertilizers, animal waste) can be volatilized when applied to the surface of soils. When incorporated in the soil, it is not readily leachable, since it is held by ion exchange as are other cations. In most agricultural soils, however, ammonium—N is usually converted to nitrate—N in a few weeks when soil is suitable for crop growth. Although the rate of this conversion is variable with source, level of aerobic activity, temperature, and other soil conditions, most ammonium fertilizer is converted to nitrate in the soil. For flooded rice culture, conditions are different, and ammonium—N persists.

Nitrates are water soluble, leachable, penetrate soil to considerable depths and can result in high accumulations, or loss to groundwater in uncropped soil. Generally, however, nitrate does not accumulate under native grasslands because during much of the crop year it is utilized by the crop (150). Nitrate added as fertilizer or produced in the soil while plants are not growing may be leached below the root zone where it will either accumulate or move into groundwater. In high rainfall areas, the latter is very likely.

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Water moves downward in soils when precipitation or irrigation exceeds loss of water by evapotranspiration. Nitrate may also move downward in the absence of a growing crop, and hence leaching is most likely to occur in late fall, winter, and early spring. Situations most conducive to loss of nitrogen from runoff and erosion occur when high rates of nitrogen are applied on sloping lands (an unlikely occurrence as such lands are usually in pasture) subject to intensive rainfall, when heavy rainfall occurs immediately following surface application of fertilizer, when fields are inadequately protected by plant cover, or when soils have low rates of infiltration.

Despite their limitation as analytical tools, runoff plots can yield data to illustrate the importance of crop cover, and also to compare treatments (152). Comparison of nutrient losses from fertilized and unfertilized plots in a small watershed shows no appreciable differences in nutrient content of runoff (153). Additions of N, P, K, and S in precipitation exceeded the losses in surface runoff and groundwater flow. Additions of these nutrients to surface waters by precipitation is often sufficient to promote algal growth.

Animal wastes and sewage sludges applied to the surface of the land as fertilizers, or stored on the surface, can yield runoff hazardous to surface waters. When placed on soil, manures and sludges should be incorporated as soon as possible to prevent groundwater pollution through runoff. Leaching of N from these organic materials can be a serious problem.

Degradation of ground water with soluble salts and nitrate from animal waste and sewage sludges is one of the factors limiting their use on the land. The pollution of groundwater by the nitrate and soluble salts will be most serious where the amounts of nitrate greatly exceed the needs of the crop, an increasingly serious problem in the area of large feedlots. Cattle in a 60,000-animal capacity feedlot excrete approximately 10^6 t of manure containing about 4000 t N annually within an area of 150 hm^2 . Accumulation and storage of the waste can present serious problems of air and water pollution. To spread this amount of manure on the land at the rate of 23 t/hm^2 , not an uncommon rate, requires 4000 hm^2 , an area not usually accessible to most feedlots. Such large amounts of waste applied to the soil contain N far in excess of crop needs. Development of safe handling and use of this waste is receiving extensive study.

One main factor limiting the long-range use of sewage sludge on agricultural land is the potential hazard associated with the presence of certain heavy metals sometimes introduced by industrial effluents. The elements of greatest concern are zinc, copper, nickel, and cadmium. These elements, which are toxic to animals and man at high levels, are taken up by plants. Since they accumulate in the soil, the fear is that long-term heavy use of sewage sludge on soil will lead to hazardous amounts. Wide dispersion of sewage sludge, as by combining it at appropriate levels with commercial fertilizers, may be useful in this regard. Long-term experiments needed to evaluate the delayed effects are in progress. Economic factors also have limited the large-scale use of sewage sludge as fertilizer.

The loss of nitrogen and nitrogen oxides (mostly N_2O) from soil was mentioned earlier. Concern has arisen about the role of N_2O in depleting the ozone layer in the stratosphere. Important aspects of this phenomenon are yet to be clarified—the extent to which N_2O actually destroys the ozone, what fraction of fertilizer nitrogen undergoes denitrification to produce N_2O , how long N_2O remains in the atmosphere, and whether the oceans contribute most of the N_2O found in the atmosphere. Estimates of the extent of destruction of the ozone layer by N_2O have varied widely (154) (see Air pollution; Ozone).

The best hope of unraveling the complexities of the fate of fertilizer nitrogen in soil lies with research in progress using fertilizers labeled with ¹⁵N-depleted nitrogen. Using this tool, scientists at TVA's National Fertilizer Development Center in cooperation with Los Alamos Scientific Laboratory, USDA, and university scientists across the United States are conducting field studies of the fate of fertilizer nitrogen in a variety of soils, climates, and types of agriculture (155). The method offers promise of leading to improved efficiency in use of fertilizer nitrogen and protecting the environment.

Phosphate. Phosphorus behaves entirely differently than nitrogen in soils, since it is strongly retained by most soils except siliceous sands and organic soils. The quantities of fertilizer P transported to surface and groundwaters is very difficult to determine under field conditions. However, many research reports show losses of P in solution to be about 1 kg(hm²-yr). The situation is confused by the fact that the concentration of phosphorus in drainage waters is directly related to the phosphorus content of the rocks from which a soil is formed; the phosphorus content of rivers in high phosphatic limestone areas may range up to 0.22 ppm whereas those in sandstone and shale areas may contain only a trace. Moreover, whether soil is unfertilized or heavily fertilized, the concentration of phosphorus in the soil solution is usually within one order of magnitude of 0.1 ppm. Streams draining the most intensively cultivated watersheds carried concentrations of phosphorus below 0.03 ppm and the general levels were unchanged between 1921 and 1972 despite an eight- to tenfold increase in phosphorus fertilization (156).

Water-soluble phosphorus applied to fine-textured mineral soils is rapidly converted to solids only sparingly soluble in water. Generally, therefore, phosphorus is not leached from these soils. There is little question, however, that downward movement of P in highly siliceous sands may constitute a pollution hazard in localized areas. Similarly, organic colloids have little capacity to absorb P because of their low concentrations of Fe, Al, and Ca. This is important in choosing soluble or water-insoluble phosphate sources for organic forest soils.

The chemistry of soil phosphorus is different in flooded soils. Ferrous phosphate, a compound more soluble than the ferric phosphates of nonflooded soils, is formed. Moreover, the pH is increased and free iron oxide coatings are reduced, resulting in the release of occluded phosphate. These reactions occur and are important in paddy rice culture.

Sediment from soil erosion and other sources carries about 1.8×10^6 t of total phosphorus into United States surface waters annually (157). This sediment acts as a scavenger for dissolved phosphorus in streams, absorbing phosphorus from solutions containing more than 0.01 ppm. A practical consequence of this is that concentrations of 0.10–0.13 ppm of soluble phosphorus in runoff water from fertilized fields may be reduced to 0.009 ppm by adsorption on suspended sediment, a mechanism with large capacity for keeping phosphorus in natural waters near or below environmentally acceptable levels (156).

Reduction of runoff phosphorus in problem areas such as soils of high phosphate status, animal feedlots, and in urban runoff can be more readily achieved by water management to reduce runoff and erosion rather than by chemical treatment to remove phosphorus from the water. Farm management practices, thus, are of major importance for control of runoff and erosion. Schuman and co-workers (158) reported that the combined dissolved and sediment phosphorus lost from contour-plowed corn was

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nearly ten times higher than those losses from level-terraced corn when the two were fertilized at the same rate. Phosphorus losses from brome-grass pasture were substantially below those from contour-plowed corn fertilized at the same level.

In general, the trends for phosphorus pollution from animal wastes parallel those for nitrogen. Storage and application practices are crucial. Fall application of manure on alfalfa gave the highest losses, whereas fall application to fall-plowed cornfields gave much smaller losses (159).

Perspective and Corrective Measures. The production and use of fertilizers are vital for adequate production of food and fiber for human needs. To continue to meet these needs will require further increase in use of fertilizer. Although the impact on the environment of fertilizer nutrient losses from agricultural soils is difficult to quantify, losses to surface and groundwater do occur, erosion losses probably exceeding those of solution. It is not unusual to find that the combined pollutants from nonhuman sources and domestic sewage far exceed those from farming. Moreover, the farming inputs are only partially owing to use of commercial fertilizer. As important as control of soil erosion is for reducing losses of biologically active phosphorus to streams, on a national (U.S.) basis the effect of reducing soil erosion is small compared to the reduction that would result from tertiary treatment of municipal sewage.

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USDA and EPA evaluated control of pollution from cropland (160) and listed the following practices for control of nutrient loss from agricultural applications: elimination of excessive fertilization; proper timing of nitrogen application; using crop rotations; using animal wastes for fertilizer; plowing under green manure crops; using winter cover crops; controlling fertilizer release; incorporating surface applications; controlling surface applications; using legumes in haylands and pasture; and timing fertilizer plow-down.

Energy Requirements for the Production and Distribution of Chemical Fertilizers in the United States

Production and distribution of fertilizers in the United States consumed only about 0.7% of the total national energy consumption at the 1976 level of production. The total national energy consumption of fertilizers in the United States agricultural system from extraction of raw materials to the application of fertilizer to the soil is about 5.67×10^8 GJ (538×10^{12} Btu), according to Davis and Blouin (161). About 88% of the total is for production, 1% is for transportation of raw materials, and 11% is for transportation, storage, handling, and application of the fertilizer. Energy requirements for production of the fertilizers are summarized in Table 18.

The estimated energy for raw material and product transportation is 38.5×10^6 GJ (36.5×10^{12} Btu), that for field application is 9.92×10^6 GJ (9.41×10^{12} Btu), and that for storage and transfer is 22.79×10^6 GJ (21.62×10^{12} Btu).

Although the energy consumed in fertilizer production and use is a very small percentage of total national energy consumption, the shortage of energy and its high cost make it a matter of concern, and serious efforts by the industry toward lowering energy consumption are underway. According to a recent report of The Fertilizer Institute (162), the average energy consumption per unit of fertilizer produced was reduced by 12% over the period 1972–1977.

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VOLUME 17

PEROXIDES AND PEROXY COMPOUNDS, INORGANIC TO PIPING SYSTEMS



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direct methods of flame spectroscopy are used for low concentrations of phosphorus. Fluorometry, spark-source mass spectroscopy, infrared spectroscopy, electron spectroscopy, and nuclear magnetic resonance spectroscopy have also been employed (see Analytical methods).

Environmental Considerations

Inorganic phosphates present no hazard to humans and are essential to life processes. However, phosphorus creates environmental problems, mainly because its availability increases the growth of algae in many lakes. In recent years, considerable controversy has centered upon the contribution of phosphate-built detergents to excessive algae growth and subsequent eutrophication of natural receiving waters. Minnesota, Wisconsin, Michigan, Indiana, New York, Vermont, and Akron, Ohio, Chicago, Ill., and Dade Co., Fla., have legislated against the use of phosphorus in detergents, resulting in a patchwork of restrictions. No two sets of regulations are exactly alike; some restrict only home laundry detergents, others cover a range of household and commercial cleaning products.

Problems apparently caused by sewage-borne phosphates are mostly localized to areas that have traditionally employed lakes as receiving waters for sewage effluents. Average phosphorus concentrations vary in municipal sewage for several reasons, including industrial waste input, storm waters, seasonal fluctuations, and daily living-habit cycles. Extreme values range between 3 and 15 mg/L (typical 5–9). The chemical form of phosphorus in waste varies, including soluble orthophosphates, condensed phosphates, insoluble salts, and numerous forms of organic phosphorus. Activated-sludge treatment considerably reduces the condensed phosphates to orthophosphates. Thus, the principal inorganic phosphorus input to receiving waters via sewage effluent is orthophosphate. It is believed that much of this is precipitated as inactive phosphorus, which is trapped in sediments where it is ultimately converted to an apatite.

The growth of algal nuisance blooms is complex and appears to involve a symbiotic relationship between algae and bacteria. Sewage effluent, treated or raw, provides an excellent growth medium for both organisms. There is little doubt that phosphorus is one of the nutrients supplied. It is open to question, however, as to whether a banning of phosphate detergents and cleaners sufficiently reduces phosphorus input to the very low levels needed to control algal growth when, in fact, natural wastes and fertilizers provide most of the phosphorus input to receiving waters. A more logical, but more costly, approach is phosphorus removal during sewage treatment.

Investigation of the effects of phosphorus on the environment is in its initial stage; the issue is further complicated by the lack of an adequate data base. Mankind cannot prohibit phosphorus, as it is an essential part of the natural order of the world. However, it has to be controlled when necessary. The simplistic approach of legislating detergent phosphates, although helpful in some isolated cases, does not accomplish this goal. An excellent review of this area is available (10).

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COVERAGE

REFERENCE # 12

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LOGBOOK REQUIREMENTS REVISED - NOVEMBER 29, 1988

NOTE: ALL LANGUAGE SHOULD BE FACTUAL AND OBJECTIVE

- Record on front cover of the Logbook: TDD No., Site Name, Site Location, Project Manager.
- 2. All entries are made using ink. Draw a single line through errors. Initial and date corrections.
- Statement of Work Plan, Study Plan, and Safety Plan discussion and distribution to field team with team members' signatures.
- Record weather conditions and general site information.
- Sign and date each page. Project Manager is to review and sign off on each logbook daily.
- Document all calibration and pre-operational checks of equipment. Provide serial numbers of equipment used onsite.
- Provide reference to Sampling Field Sheets for detailed sampling information.
- Describe sampling locations in detail and document all changes from project planning documents.
- Provide a site sketch with sample locations and photolocations.
- Maintain photo log by completing the stamped information at the end of the logbook.
- If no site representative is on hand to accept the receipt for samples, an entry to that effect must be placed in the logbook.
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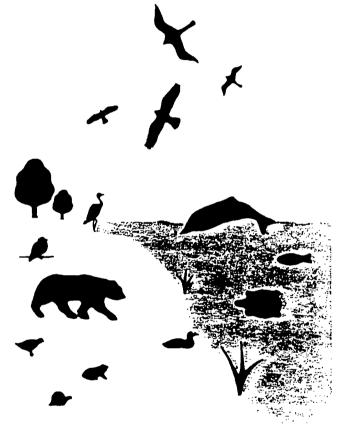
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1:250 000-scale map of Gulf Coast Ecological Inventory





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SYMBOL

AQUA	IC ORGANISMS (continued)					
SYMBOL	SPECIES					
FISH	(100-299)					
	Blue runner					
	Atlantic thread herring					
	Chain pickerel					
206	Rivulus					
	Key blenny					
208	Striped bass					
209	Atlantic sturgeon (S)					
210	Atlantic sturgeon (S) Suwannee bass Redbreast sunfish					
211	Redbreast sunfish					
212	Spotted sunfish					
213	Flier Redfin pickerel					
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	Skipiack herring					
210	Spanish sardine Bluestripe shiner (S)					
220	Shoel bass					
	Blackmouth shiner (S)					
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223	Coastal darter (S)					
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	White bass					
228	Yellow bass					
229	Alligator gar					
230	Blue sucker					
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233	Gafftopsail catfish Silver seatrout					
	Silver seatrout					
	Bluenose shiner					
	River redhorse					
237	Freckled darter					

FISH (100-299) Hinds Yellowfin grouper Scamp Yellowedge grouper Palometa Yellow jack 252 Yellow Jack 253 Bar Jack 254 Horse-eye Jack 255 Hogfish 256 Owarf seahorse REPTILES AND AMPHIBIANS (300-349) 300 Green saa turtle (F) 301 Loggerhead sea turtle (F) 302 Hawksbill sea turtle (F) 303 Kemp's Ridley sea turtle 304 Leatherback sea turtle (I) MAMMALS (350-399) 350 West Indian manatee (F) West Indian manatee (F) Atlantic bottlenose dolphin Atlantic spotted dolphin Finback whale (F) Sperm whale (F) Right whale (F) Short-finned pilot whale False killer whale Pygmy sperm whale Minke whale

AQUATIC ORGANISMS (continued)

SPECIES

Striped dolphin Killer whale High satinity estuarine habitat (ganerally greater than 20 parts per thousand); arrows used for wide estuaries. Middle salinity estuarine habitat (generally 5 to 20 parts per thousand).

Low salinity estuarine habitat (generally 0.5 to 5 parts per thousand) and tidal fresh water. Non-tidal freshwater riverine and creek habitat.

Species composition changes where denoted by an asterisk,

TERRESTRIAL ORGANISMS

Shown in BROWN: species with special status shown in RED-(F) or (S) indicates species protected by Federal or state legislation; all Latin names given in text.

SYMBOL

186 187 188

189 190 191

192

193

198

201

Butterflyfish Surgeonfish Swordfish Blue martin White martin

White martin Skipjack tuna Blackfin tuna White mullet *Crevalle jack Florida gar Gizzard shad Sunshine bass Silver perch Sea bass

Sea bass Yellowmouth grouper

Striped mojarra Guif flounder

Cardinalfish

(continued)

SPECIES

PLANTS (400-499)

Lance-leaved wake-robin

406

Lance-leaved wake-robin (5)
Fiorida royal palm (5)
Orchids (5)
Bromeliads (5)
Royal palm-bald cypress forest
Ferns (5)
Cacti (5)
Lignum vitae (5)
Palms (5)
Chapman's rhododendron (F)
Hollies (5)
Peopers (5)
Coonties (5)
Four-cetal pawaw (5)
Sandhilf mikweed (5)
Sea lavender (5)
Catoosis (5)
Giant dewitower (5)
Giant dewitower (5)

TERRESTRIAL ORGANISMS (continued)

Bluntnose minno Bluntface shine Rainbow darter Paddlefish (S) Triggerfish

Squirrettish Rio Grande cichlid Silk snapper

(continued)

SPECIES SYMBOL

237 238

246

WADING BIRDS (600-649)

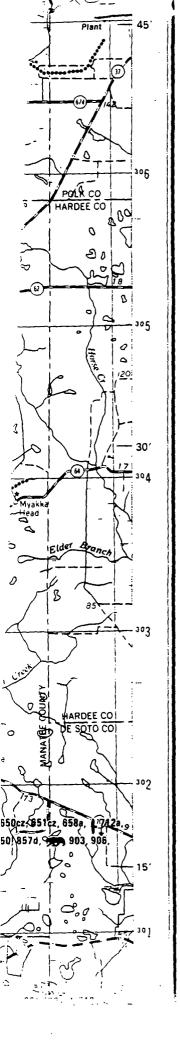
Great blue heron Reddish egret (S) White-faced ibis (White ibis Roseate spoonbill Roseate spoonbill
Great egret
Snowy egret
Louisiana heron
Black-crowned night heron
Little blue heron Cattle egret Ibises
Yellow-crowned night heron Rails
Least bittern
Gallinules
Florida sandhill crane (S)
Great white heron
American bittern Rails 623 American bittern 621 Limpkin 621 Mississippi sandhill crane (F) 621 Whooping crane (F) 631 Least grebe 634 Surdinic crane.

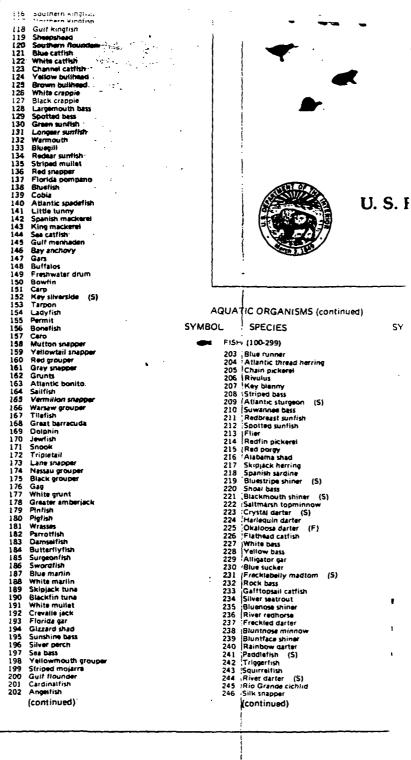
TERRESTRIAL ORGANISMS (continued)

SYMBOL SPECIES

SONGBIRDS AND OTHERS (800-849)

GBIRDS AND OTHERS
Florida scrub jay (S)
Yellow-rumped warbler
Ringed turtle dove
Bachman's sparrow
Hooded warbler
Brown-headed nuthatch
Perching birds
Groove-billed an
Yellow-headed blackbird
Warblers
Goatsuckers
Fringulids
Louisana waterthrush
Sprague's pintt 829 830 Sprague's pipit
Stoddard's yellow-throated warbler
Mourning dove
Ring-necked pheasant Chachalaca Miskagee Bygatcher Findical Findicing





TERRESTRIAL ORGANISMS

Shown in BROWN; species with special status shown in RED-(F) or (S) indicates species protected by Fede or state legislation; all Latin names given in text.

SYMBOL

SPECIES

PLANTS (400-499)

- Lance-leaved wake-robin (5) Florida royal palm (5) Orchids (5) Bromelieds (5) Bromelieds (5) Royal palm-bald cypress forest Ferns (5) Cacti (5) Lignum vitte (5)

- Cact: (5)
 Palms (5)
 Palms (5)
 Chapman's rhododendron (F)
 Hollies (5)
 Peppers (5)
 Coonties (5)
 Four-petal pawpaw (5)
 Sandhill milkwed (5)
- Sandhill milkweed Sea lavenoer (S) Catopsis (S) Giant dewflower (Pagoda dogwood Okeechobee gourd Manchineel (S) Fall-flowering issa Key Cassid (S)

TERRESTRIAL ORGANISMS (continued)

SYMBOL

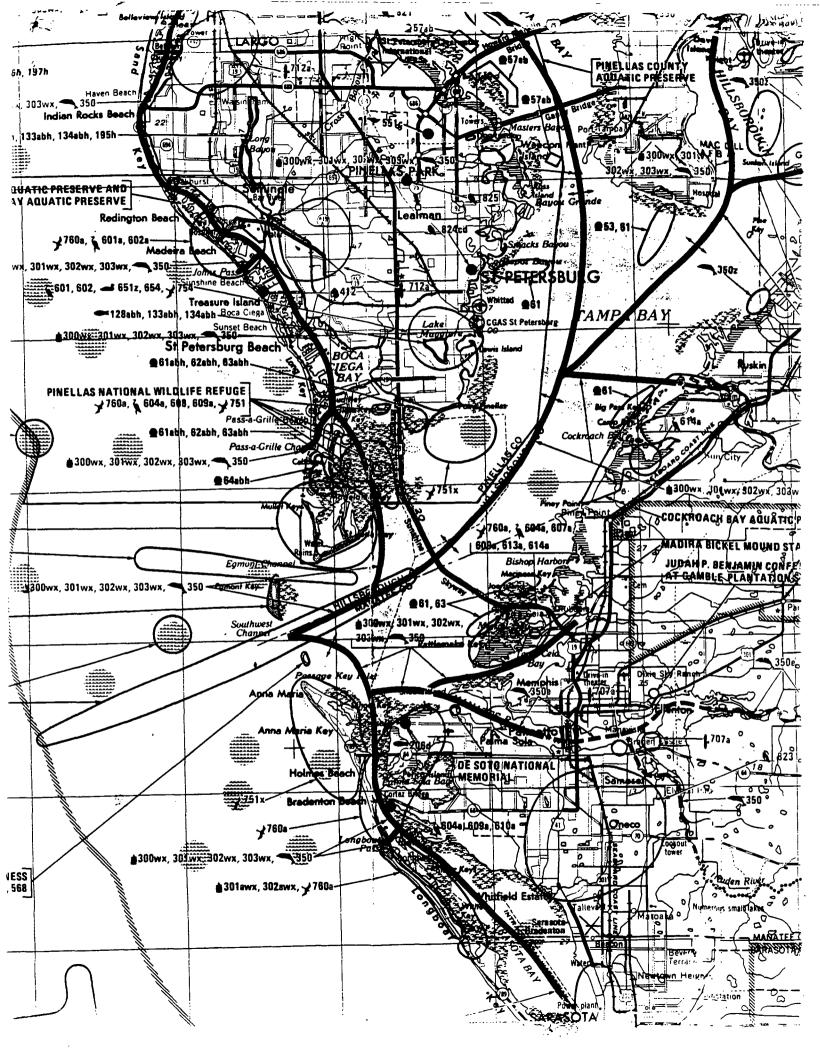
SPECIES

WADING BIRDS (600-649)

- Great blue neron Reddish egret (S) White-faced ibis (S) White ibis

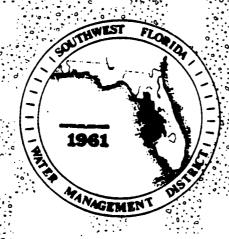
 - Roseate spoonbill
- 601
- Great egret
 Snowy egret
 Louisiana heron
 Black-crowned night heron
- stack-crowned night heron Little blue heron Cattle egret Ibises Yellow-crowned night heron Rails

- Rails
 Least bittern
 Gallinules
 Florida sandhill crane (5)
 Great white heron
 American bittern
 Limbiun
 Mississippi sandhill crane (1)
 Whooping crane (F)
- Least grede Sandhill cranes
- WATERFOWL (1.00-25) $\alpha = 2e^{\alpha_1 \alpha_2 \alpha_3 \alpha_4}$



GROUND-WATER RESOURCE AVAILABILITY INVENTORY:

MANATEE COUNTY, FLORIDA



SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT MARCH 1988



GROUND-WATER RESOURCE AVAILABILITY INVENTORY: MANATEE COUNTY, FLORIDA

PREPARED BY: RESOURCE MANAGEMENT AND PLANNING DEPARTMENTS OF THE SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

MARCH 1988

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

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composed of carbonate deposits (usually dolomitic) that contain varying amounts of interbedded quartz sand, clay, and phosphate. The middle section consists of interbedded sandy carbonate, clayey sand, and sandy clay. The upper Hawthorn section is predominantly composed of clastic deposits that consist of quartz, phosphate sand and pebbles, and light green to a moderately dark gray clay (Hall, 1983). The trifold subdivision of the Hawthorn Formation is most apparent in the south. Elsewhere, one or two of these units may be absent, or the upper unit may lie directly over the lowermost unit. In the north, the units become less distinctive and merge to a single unit where a sandy phosphatic clay perdominates, or the Formation is absent. The thickness of the entire Hawthorn Formation varies from thin to absent in the northern areas of the SWCFGWB to greater than 600 feet in the southern areas.

Oligocene - The only formation of this epoch is the Suwannee Limestone. It is composed of hard, yellow or creamy fossiliferous limestone, which locally has an orange tinge. Interbeds may contain quartz sand, and dolomite is common toward the unit's base from the Tampa Bay area southward. The upper part may contain thin chert lenses and be highly macrofossiliferous. The Suwannee is exposed in parts of Pasco County, and in the northeast corner of Hillsborough County, and pinches out in Polk County. The Suwannee is as much as 300 feet thick in the southern areas of the SWCFGWB.

Eocene Epoch - The Eocene formations within the SWCFGWB consist of the Ocala Limestone, Avon Park Formation, and Oldsmar Formation, in descending order. The Ocala Limestone consists of three units. In descending order these units are the Crystal River, Williston, and Inglis. All three units generally consists of a coquinic foraminiferal limestone, usually cream to white in color. The Inglis Member frequently contains gray to brown dolomite, and chert layers that can be present throughout the entire Ocala Limestone. The Ocala Limestone outcrops in northern Polk and southern Sumter Counties within the Green Swamp area (Pride and others, 1966). The Ocala ranges in thickness from less than 300 feet in the northern areas of the SWCFGWB to greater than 600 feet in thickness in the southern areas.

The Ocala is unconformably underlain; by the middle Eocene Avon Park Formation. Lithologically, the Avon Park is composed of fossililferous limestone and dolostone. The limestone is moderate brown, dark-yellow brown to rusty-yellow brown, porous and very fine to medium grained and may be crystalline or saccharoidal in texture. The top of the Avon Park may contain peat or carbonaceous layers and the bottom may contain small lenses of evaporite. The Avon Park Formation thickens to greater than 1,000 feet in the SWCFGWB. The Avon Park is the deepest potable water bearing formation in the SWCFGWB, therefore, older geologic formations will not be discussed at LMED

KARST ACTIVITY

Florida's landscape, including the SWCFGWB, is dominated by features of karst topography. Karst topography develops where rainfall drains internally and rocks are susceptible to solution (Ritter, 1979). In these areas, the solution process can create and enlarge cavities within the rocks and allow underground circulation of water which, in turn, promotes further solution. This leads to

TABLE 3: Major springs and flow in the Southern West-Central Florida Ground-Water Basin (from Roseneau and others, 1977).

INDEX	SPRINGS	DISCHG(CFS)	INDEX	SPRINGS	DISCHG(CFS)
1	SALT	9.5	7	SIX MILE CREEK	K 1.5
2	CRYSTAL	60	8	BUCKHORN	15.5
3	HEALTH	6.5	9	LITHIA	51
4	SULPHUR	44	10	KISSENGEN	9.5
5	LETTUCE LAKE	9.5	11	WARM MINERAL	1
6	EUREKA	1.5	12	UNNAMED	30

GROUND WATER

Surficial Aquifer System

A distinct surficial aquifer system exists throughout nearly all of the SWCFGWB and consists of marine and non-marine quartz sand, clayey sand, shell, shelly marl, and phosphorite, with occasional stringers of marl and limestone. The surficial system extends from land surface to the top of the upper confining bed of the Caloosahatchee Marl, Bone Valley Formation, Tamiami Formation, or Formation, whichever is first stratigraphically Water in the surficial aquifer system is generally encountered. unconfined; however, locally within the aquifer system are weak semi-confined layers that poorly confine the ground water. Average thickness of the aquifer is about 25 feet, but ranges from a foot or less, where limestone or clay outcrop or are near land surface, to several hundred feet beneath the Highland Ridge (Figure 13). Extreme thicknesses of 300 to 600 feet or more have been reported along the eastern side of the Lake Wales Ridge in Polk County (Stewart, 1966).

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Surficial Aquifer Hydraulic Properties

Hydraulic properties of the surficial aquifer system in the SWCFGWB vary widely due to variation in types of material that comprise the aquifer; its physical characteristics, such as grain size and sorting; and thickness of the saturated zone. Hydraulic properties for the surficial aquifer system are listed in Table 4. The locations of the aquifer test sites at which these values were derived are given in Figure 19.

Transmissivity of the surficial aquifer system ranges from about 20 feet squared per day (ft^2/d) where fine clayey sand predominates, to greater than 5,000 ft $^2/d$ in some clean shell beds in the southern areas of the SWCFGWB. Transmissivities are lowest to the north and along the coast where the aquifer is composed of mostly fine grained clastics, and saturated thickness is least. Transmissivities are greatest in southern Sarasota, Charlotte, and Lee Counties.

Specific yield of the surficial aquifer ranges from 0.05 to 0.3 (Wilson and Gerhart, 1980). Determinations of vertical hydraulic conductivity have been made from lab tests on undisturbed samples, range from 0.12 x 10^{-5} to 13 feet per day (ft/d) (Sinclair, 1974; Hutchinson and Stewart, 1978; Healy and Hunn, 1984). Determinations of horizontal hydraulic conductivity range from 0.0028 ft/d to greater than 1,000 ft/d (Healy and Hunn, 1984).

III. MANATEE COUNTY OVERVIEW

Geographic Setting, Physiography - Topography, and Drainage

Manatee County is located on the west-central coast of Florida and fronts on Tampa Bay at its southern-most point. Manatee County is bounded by Hillsborough County on the north, Hardee and DeSoto Counties to the east, Sarasota County on the south, and the Gulf of Mexico and Tampa Bay to the west (Figure 53). Manatee County contains about 739 square miles of land area and 46 square miles of inland surface-water area. Land surface altitudes range from sea level along the coast to about 135 feet above NGVD in the northeast (Figure 54).

The physiographic provinces of Manatee County were described by White (1970). These provinces are the Gulf Coastal Lowlands, the DeSoto Plain, and the Polk Upland (Figure 6). The ancient stands of sea level above its present level during Pleistocene time shaped the topography into marine terraces across the county. The Pamlico Terrace, generally less than 20 feet above NGVD, and the Talbot Terrace, about 40 feet above NGVD, form the relatively flat, poorly drained Gulf Coastal Lowlands. The Penholoway Terrace, about 60 to 70 feet above NGVD and the Wicomaco Terrace, about 90 to 100 feet above NGVD, make up the DeSoto Plain. The highest and oldest surface is the Sunderland Terrace that formed when the sea was 170 feet above the present level. The Polk Upland physiographic unit was formed by the Sunderland Terrace. Recent stream and river erosion have modified these terraces but large areas of relatively flat land remain where the drainage is poor.

Principal surface-water drainage for the county is through the Manatee, Little Manatee, Myakka Rivers, and their tributaries. Many coastal streams drain directly into the Gulf of Mexico. The large flatland areas of the county are poorly drained and contain many small, shallow lakes and swamps. A canal network has been dug throughout the county to augment natural drainage (Brown, 1983).

Climate

The climate of Manatee County is humid and sub-tropical, characterized by high mean annual rainfall and temperature. Warm humid summers and mild winters are the result of the low latitude and the stabilizing affect of the Gulf of Mexico and the Atlantic Ocean.

Data collected by the National Weather Service indicate that the mean annual air temperature in the county is about 72°F, and mean monthly temperatures range from 60°F in winter to 80°F in summer. Summer temperatures usually peak in the low to mid-90's but are moderated by frequent afternoon convectional thundershowers. Winter temperatures vary the most during late winter when cold fronts bring arctic air from the northwest. These fronts may bring minimal temperatures below freezing but day light temperatures rarely reach freezing levels. Cold weather generally lasts only two to three days and are separated by warm days (Wolf and others, 1986). Average low temperatures are near 50°F during the coldest months (December, January, and February).

Lessor amounts of water are withdrawn from the surficial and intermediate aquifer systems and are used primarily for domestic supply, with other uses including stock watering, agricultural irrigation, and small public supplies. Most irrigation wells that penetrate the Floridan aquifer are also open to the intermediate system.

Surficial Aquifer System(*)

In Manatee County, the surficial aquifer system is composed primarily of deposits of sand, gravel, shells, and limestone whose composition may vary laterally and vertically. comprise the Pliocene to Recent age undifferentiated sands, terrace deposits, and the Bone Valley Formation. In the eastern and central part of Manatee County, the aquifer consists mostly of medium to fine-grained, well-sorted, quartz sand and ranges in thickness from about 10 to 90 feet (Figure 65). Within this area, the sands contain a hardpan layer that consists of sand and carbonaceous and limonitic material that averages about 5 feet in thickness. The hardpan retards vertical flow of water. The sandy clays of the Bone Valley and Hawthorn Formations form the base of the surficial system in eastern Manatee County. In the western part of the county, the system consists of sand, sandy limestone, and shell and ranges from about 1 to 20 feet in thickness. The sandy clays, clays, and marls form the base of the surficial system. A listing of aquifer coefficients derived from aquifer tests of the surficial aquifer system in the SWCFGWB are included in Table 3. Locations of these tests are given in Figure 19. Seasonal fluctuations in the water table are generally less than 5 feet and are generally lowest in April or May and highest in September.

The direction of ground-water flow in the water table is generally west and south in Manatee County. The configuration of the water surface is similar to that of the land surface. Water surface is at sea level along the coast and increases to altitudes of about 130 feet above NGVD in the northeast area of the county. Depth to the water table ranges from zero in coastal and flat, poorly drained areas, to about 10 feet below land surface in topographically high areas. The average depth to the water table is about 5 feet.

In some areas, the surficial aquifer is confined by layers of hardpan, clay, or limestone. Many shallow wells in the county penetrate one or more of these confining layers. Generally, the artesian pressure is insufficient to produce flowing wells (Peek, 1958b). The surficial aquifer supplies the least quantity of water in the county. Small volumes of water are used for domestic use, lawn irrigation, or stock watering. Most wells that tap the surficial aquifer have small diameters and yield less than 50 GPM. Most surficial wells are finished as open holes; some are screened.

Aguifer Properties

The transmissivity of the surficial aquifer in Manatee County ranges from less than 267 to about 5,304 ft 2 /d (Table 3). The transmissivity of the thick sand and phosphorite deposits in the southcentral part of the county probably ranges from about 1,000 to 2,000 ft 2 /d (Brown, 1983). Similar transmissivity was reported by Wilson (1972) and Hutchinson and Wilson (1977a) for surficial deposits in

DeSoto and Hardee Counties. Transmissivity of the surficial aquifer in Charlotte County south of Manatee County, that consists of sand and interbedded shell and limestone similar to deposits in western Manatee County, was reported to be about $7,000 \, \text{ft}^2/\text{d}$ (Sutcliffe, 1975).

The storage coefficient of an unconfined aquifer is virtually equal to the specific yield, which is commonly determined by laboratory drainage tests. In Manatee County, the storage coefficient of the surficial aquifer is 0.05 to 0.12 (Table 3). Similar estimates of storage coefficients based on laboratory specific-yield tests of similar deposits in Polk County (Pride and others, 1966) and in Hillsborough County (Sinclair, 1974) and on an aquifer test in southeastern Hillsborough County (Hutchinson, 1978).

Water Quality (*)

The chemical quality of ground water is primarily affected by the quality of rainfall that recharges to the aquifer, types of rocks in which water is in contact, and length of time water has been circulating within the aquifers. In Manatee County, the chemical quality is also affected by intrusion of seawater or the mixing of relatively fresh water with highly mineralized water, believed to be residual seawater within the water-bearing formations (Peek, 1958a).

Wells that penetrate deep water-bearing zones are commonly constructed with tens to hundreds of feet of open hole and are open to one or more water-bearing zones. Water in each zone has distinctive water-quality characteristics. Thus, the quality of water pumped depends on which zones are tapped and the proportion of water derived from each.

The dissolved mineral content of water from the surficial system in Manatee County varies greatly. Water is generally of potable quality except near the coast and tidally affected streams where saltwater intrusion has taken place.

In northeastern Manatee County, the surficial system is composed of relatively insoluble, quartz sand resulting in water that is low in mineral content and hardness (Figure 66). Dissolved solids concentrations are usually less than 300 mg/L. Concentrations of chloride and sulfate are also low, usually less than 10 mg/L and 5 mg/L, respectively. Most water that is soft and low in mineral content has a relatively low pH.

Near the coast and tidally affected streams, water in the surficial system has concentrations of dissolved solids and chlorides of more than 200 and 50 mg/L, respectively. Concentrations of sulfate vary considerably, but are usually less than 20 mg/L. In many places along the coast, water in the surficial system is highly mineralized, approaching that of seawater. In some low-lying and coastal areas, the surficial system is highly mineralized because of infiltration or intrusion by seawater, leakage from improperly constructed wells, uncapped flowing wells, and irrigation water from wells that contain moderate to highly mineralized water (Joyner and Sutcliffe, 1976). Appendix D and E lists the water quality sampling sites and data utilized to modify and update the water quality maps for Manatee County.

Aquifer Properties (*)

The transmissivity of the Floridan aquifer system ranges from about 4,900 to 160,000 ft 2 /d (Table 3). Transmissivity of the dolomite unit of the Avon Park Limestone lower water-bearing zone ranges from about 20,000 to 700,000 ft 2 /d. Most production wells, however, are also open to the lower part of the middle zone (Ocala Limestone). In eastern and southeastern Manatee County, the transmissivity of this zone ranges from 60,000 to 150,000 ft 2 /d (Brown, 1983). In western Manatee County, the transmissivity of the upper and middle zones is about 15,000 ft 2 /d (Peek, 1958a). In northeastern Manatee County, Guyton and Associates (1976) reported an estimated transmissivity of about 3,300 ft 2 /d for the Suwannee Limestone and also indicated that little water can be produced from the Tampa Limestone.

The storage coefficients of most confined aquifers range from about 10^{-5} to 10^{-3} and are about 10^{-6} per foot of thickness (Lohman, The storage coefficient of the Upper Floridan aquifer in Manatee County ranges from 0.0002 to 0.002 (Table 3). Leakance from the surficial aquifer system to the Upper Floridan aquifer where differences in head are favorable could not be determined accurately This was due to (1) extreme thickness of the from aquifer tests. upper confining beds (about 200 to 400 feet), (2) small drawdowns due to high transmissivity of the aquifer, (3) large fluctuations in background water levels due to seasonal irrigation, and (4) short duration of most aquifer tests (less than 30 days). Leakance to the Upper Floridan aquifer is probably less than 10-4 (ft/d)/ft and is estimated to range from 0.00004 to 0.0027 (ft/d)/ft. Estimated leakances determined from aquifer tests range from 10^{-6} to 10^{-3} (ft/d)/ft. In northeastern Manatee County, William F. Guyton and Associates (1976) estimated leakance to be about 1.34x10⁻⁶ 1.34×10^{-5} (ft/d)/ft.

Water Quality(*)

Water in the Upper Floridan aquifer is generally more mineralized than water from the surficial and intermediate aquifer systems. Mineral content of the water within the aquifer varies vertically and areally. Mineral content of the water generally increases with depth of the aquifer penetrated. Water from wells open to the upper water-bearing zone is generally less mineralized than water from wells open to the middle water-bearing zones. Water from wells open to the lower water-bearing zone or to the full thickness of the aquifer has the highest mineralization.

Dissolved Solids.—Concentrations of dissolved solids in water from the Upper Floridan aquifer range from about 300 to more than 2,500 mg/L in the three major water-bearing zones. Concentrations generally increase with depth and laterally from the northeastern part of the county towards the west and south. Dissolved solids in water from wells penetrating the upper zone exceed 500 mg/L in the western and southern parts of the county (Figure 68a).

Water from wells penetrating the middle zone has dissolved solids concentrations ranging from about 300 to 1,800 mg/L (Figure 68b). In northeastern Manatee County, dissolved solids are less than 500 mg/L, and in the western and southeastern parts of the county,

subdued. Figure 5 illustrates east-west and north-south trening cross-sections that depict the topography in the SWCFGWB. Figure 6 illustrates the physiographic regions of the SWCFGWB.

The dominant river basins, ranked in descending stream flow order are the Peace, Hillsborough, Alafia, Shell Creek, Myakka, Horse Creek, and Manatee Rivers. All of these rivers have an average flow greater than 100 cubic feet per second (cfs). The major rivers begin on the Polk Upland and flow west or southwest to the Gulf of Mexico. The major wetland is the Green Swamp but many of the river flood plains are low, wetland strands.

There are numerous second and third magnitude springs in the northern area of the SWCFGWB but south of central Hillsborough and Polk almost no springs exist today. The only three springs reported are Pinehurst, Little Salt, and Warm Mineral Springs, which are all located in Sarasota County. The latter two springs exceed potable standards for salts concentration. Virtually all springflow is derived from the Floridan aguifer system.

The geology, topography, and drainage are all interdependent with water erosion shaping the limestone chemically and mechanically. The karst nature of the limestone results in solution features redirecting runoff underground. The sand and soft limestone supporting the flat to hilly topography was first shaped by beam erosion terracing the sand and stone. Afterwards, weak limestone caverns collapsed and surface erosion reshaped the highland sands. The southern plains and lowlands lack the underground drainage and typical karst topography. Surficial erosion by rivers and transgressive/regressive seas dominate the land forms. Nutrients and fresh water entering the Gulf also supports a large estuary system along the coast.

The SWCFGWB is characterized by karst terrain, in the northern and eastern areas, developed through the dissolution of the underlying shallow sinkholes. Surface drainage is absent or poorly developed in most of these areas, but waters from Hillsborough, Anclote, and Pithlachascotee Rivers flow through well-defined stream channels. Thick clay layers of the Bone Valley, Caloosahatchee, and Hawthorn Formations subdue karst activity in the flat lands of the central and southern SWCFGWB.

CLIMATE

The climate of the SWCFGWB is characterized by long, warm, humid summers and short, mild winters. Average monthly temperatures range from 61° F in January to 82° F in July and August (National Oceanic and Atmospheric Administration (NOAA), 1986). Average annual temperature is 73° F.

Some rainfall normally occurs during each month, but a SWCFGWB high rainfall season extends from June through September and a low rainfall season extends from October through May. The winter rainfall is relatively light because west-central Florida is south of the normal southern limit of winter frontal systems. About sixty percent of the annual rainfall occurs during the rainy season and is derived principally from convectional storms. The Weather Bureau Stations at St. Leo, Bartow, and Punta Gorda were chosen to

represent the SWCFGWB. Figure 7 shows the historic median and mean monthly rainfall. Figure 8 depicts the annual total rainfall record for these three weather stations in the SWCFGWB. Spatially, summer rainfall is highly variable; areas only a few miles apart often receive widely differing amounts of rain.

Estimates of evapotranspiration (ET) within the SWCFGWB vary; however, approximately 39 inches per year is generally accepted. Close to sixty percent of the total ET occurs in the six month period from May to October (SWFWMD, 1978). The highest ET rates occur in May and June.

GEOLOGY OF THE BASIN

Overview

The SWCFGWB is underlain by a thick sequence of Cretaceous and Tertiary carbonate rocks overlain by a wedge-shaped sequence of interbedded carbonate and clastic deposits. The principal hydrogeologic units are the surficial, intermediate, and Floridan aquifer systems, as described by the Ad Hoc Committee on Florida Hydrostratigraphic Unit Definition, 1984. The upper one to two thousand feet of the limestones and dolomites that comprise the Floridan aquifer system are considered the Upper Floridan aquifer (Miller, 1982). Table 1 contains the lithologic characteristics and water supply properties of the potable water bearing deposits in the SWCFGWB. Figures 9 and 10 is a hydrogeologic cross-section and a surficial geologic map of the SWCFGWB, respectively.

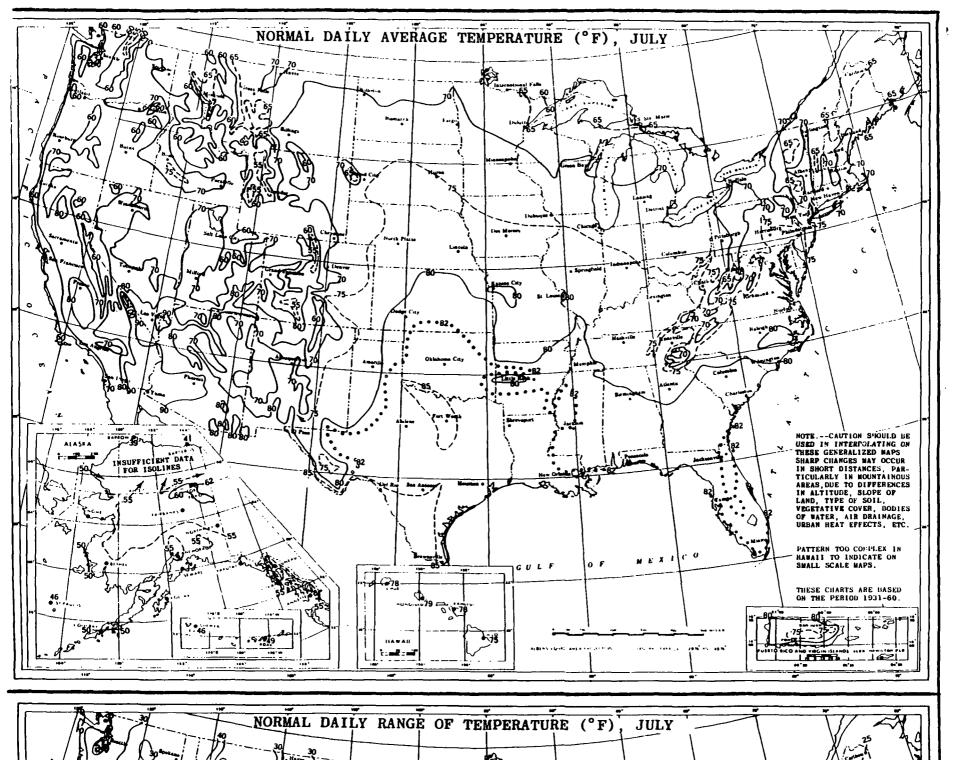
The Upper Floridan aquifer is a solution-riddled and faulted limestone comprised of chemically precipated limestones and dolomites that contain shells and shell fragments of marine origin. system was deposited throughout the Tertiary period. This aquifer system is the principal storage and water conveying component of the hydrologic system in the SWCFGWB. The carbonate units that are hydrologically significant, in ascending order include the Avon Park Formation, Ocala Limestone, Suwannee Limestone, Tampa Limestone, and portions of the Hawthorn Formation that are in hydrologic connection with underlying units. These units range in age from Eocene to The Tampa Limestone of Miocene Age is generally thin to absent throughout the northern and eastern areas of the SWCFGWB. the SWCFGWB the Upper Floridan aquifer may contain one or more inter-aquifer confining beds which, in turn, produce a multi-aquifer system. The system thickens from less than 800 feet in the north to greater than 2200 feet in the south (Figure 11).

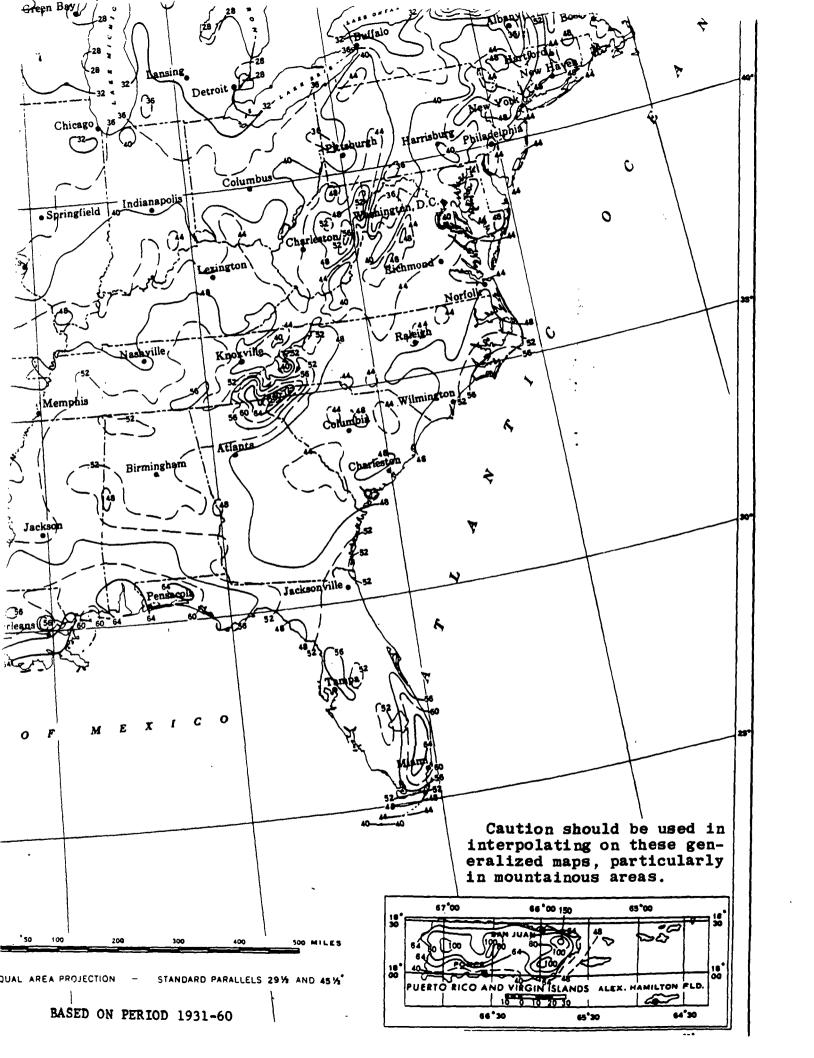
Early in the Miocene Epoch, terrestrial deposits were carried by rivers from the north and intermixed with the upper Tertiary deposits. Clastic deposition continued through the Pliocene and Pleistocene Epochs with phosphatic enrichment of clastic sediments becoming more pronounced. The Hawthorn Formation of Miocene age and the Caloosahatchee, Tamiami, and Bone Valley Formations of Pliocene and Pleistocene age predominately comprise the intermediate aquifer system. In areas of Polk, Manatee, Hardee, DeSoto, Sarasota, and Charlotte Counties, sand and clay beds within the Tampa Limestone are hydraulically connected to the overlying units and are also included in the intermediate aquifer system (Corral and Wolansky, 1984). Units of the intermediate system consist of sand, gravel,

REFERENCE # 16

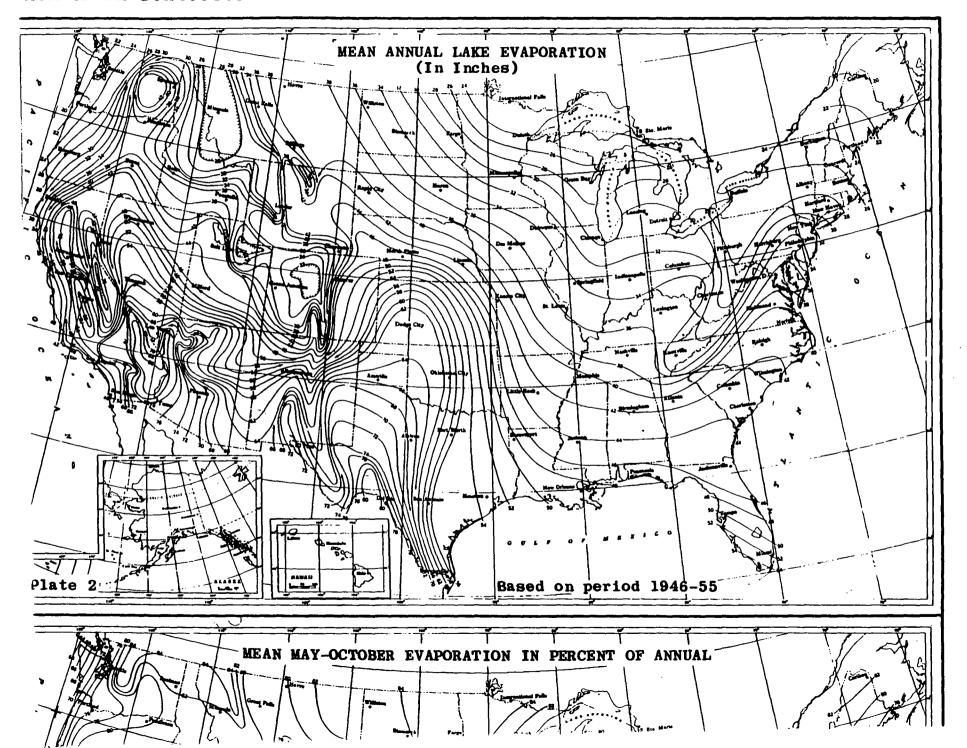
ntal Science Services Administration . Environmental Data Se

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TECHNICAL PAPER NO. 40

RAINFALL FREQUENCY ATLAS OF THE UNITED STATES

for Durations from 30 Minutes to 24 Hours and Return Periods from 1 to 100 Years

Cooperative Studies Section, Hydrologic Services Division

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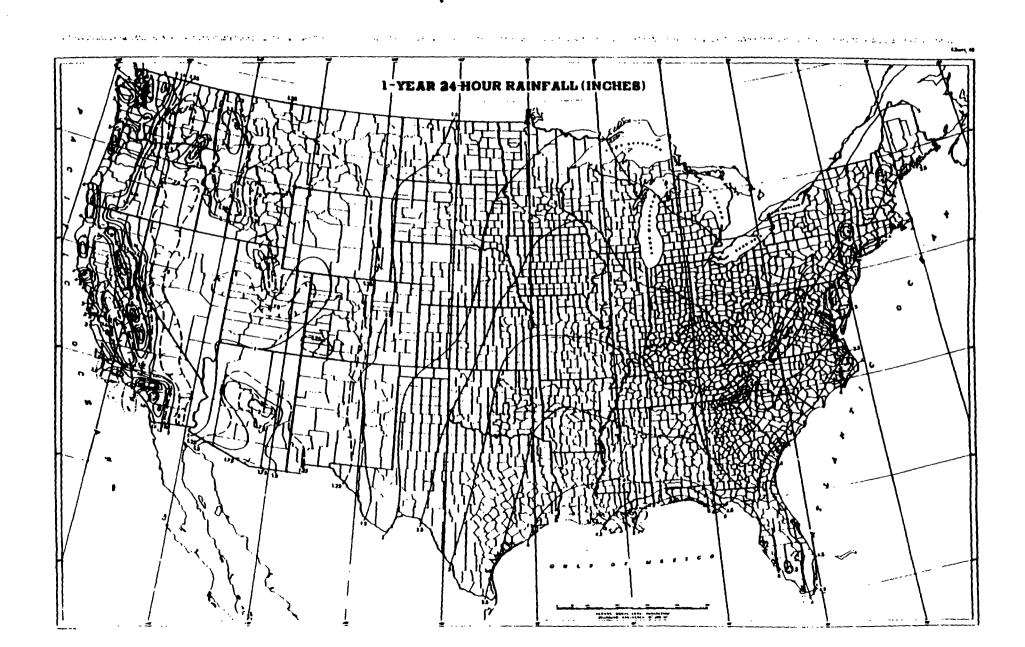
Engineering Division, Soil Conservation Service U.S. Department of Agriculture



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NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

MANATEE COUNTY, FLORIDA

(UNINCORPORATED AREAS)

PANEL 19 OF 550

(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER 120153 0019 B

> MAP REVISED: MARCH 15, 1984

Federal Emergency Management Agency

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

MANATEE COUNTY, FLORIDA

(UNINCORPORATED AREAS)

PANEL 18 OF 550

(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER 120153 0018 B

> MAP REVISED: MARCH 15, 1984



Federal Emergency Management Agency

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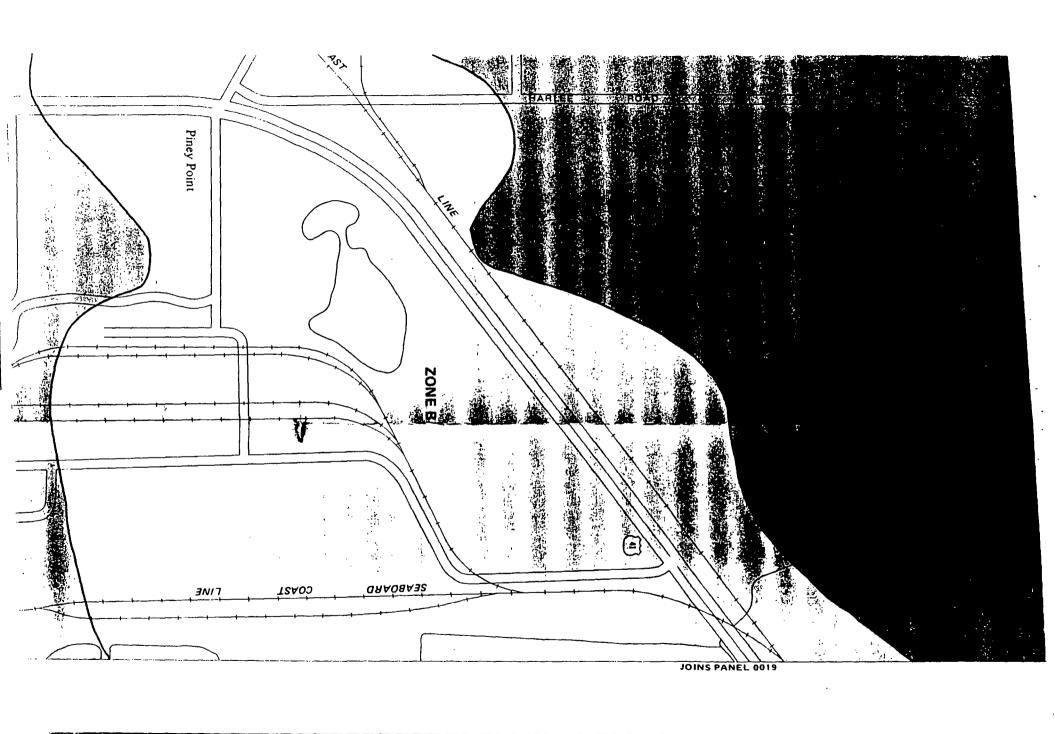
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Scurrence of Ground Water United States

With a Discussion of Principles

By OSCAR EDWARD MEINZER

GEOLOGICAL WATER-SUPPLY PAPER 457





HIC DIVISIONS AND PHYSIOGRAPHIC PROVINCES

rican Geographers, N. M. Fenneman, chairman

PROVINCE

DRASTIC: A Standardized System for Evaluating Ground Water Pollution Potential Using Hydrogeologic Settings

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Linda Aller
Truman Bennett
Jay H. Lehr
Rebecca J. Petty
and
Glen Hackett
National Water Well Association
Dublin, Ohio 43017

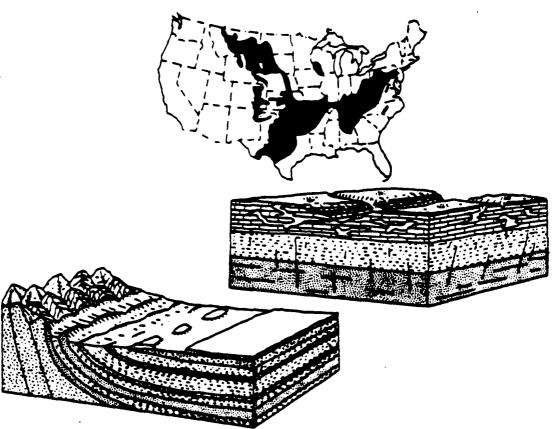
Cooperative Agreement CX-810715-01

Project Officer

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OFFICE OF RESEARCH AND DEVELOPMENT
U.S. ENVIRONMENTAL PROTECTION AGENCY
ADA. OKLAHOMA 74820

6. NONGLACIATED CENTRAL GROUND-WATER REGION



6 A	Mountain Slopes
6 B	Alluvial Mountain Valleys
6C	Mountain Flanks
6Da	Alternating Sandstone, Limestone and Shale - Thin Soil
6Db	Alternating Sandstone, Limestone and Shale - Deep Regolith
6 E	Solution Limestone
6Fa	River Alluvium With Overbank Deposits
6Fb	River Alluvium Without Overbank Deposits
6G	Braided River Deposits
6Н	Triassic Basins
61	Swamp/Marsh
6 J	Metamorphic/Igneous Domes and Fault Blocks
6K	Unconsolidated and Semi-consolidated Adulfers

6. NONGLACIATED CENTRAL REGION

(Thin regolith over fractured sedimentary rocks)

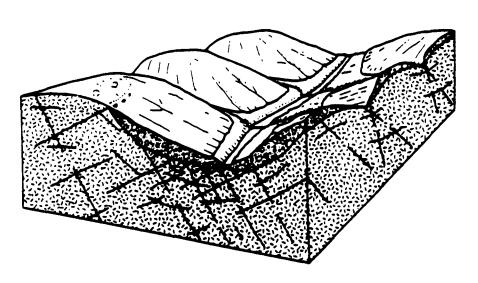
The nonglaciated Central region is an area of about 1,737,000 km² extending from the Appalachian Mountains on the east to the Rocky Mountains on the west. The part of the region in eastern Colorado and northeastern New Mexico is separated from the remainder of the region by the High Plains region. The Nonglaciated Central region also includes the Triassic Basins in Virginia and North Carolina and the "driftless" area in Wisconsin, Minnesota, Iowa, and Illinois where glacial deposits, if present, are thin and of no hydrologic importance. The region is a topographically complex area that ranges from the Valley and Ridge section of the Appalachian Mountains on the east westward across the Great Plains to the foot of the Rocky Mountains. It includes, among other hilly and mountainous areas, the Ozark Plateaus in Missouri and Arkansas. Altitudes range from 150 m above sea level in central Tennessee and Kentucky to 1,500 m along the western boundary of the region.

The region is also geologically complex. Most of it is underlain by consolidated sedimentary rocks that range in age from Paleozoic to Tertiary and consist largely of sandstone, shale, carbonate rocks (limestone and dolomite), and conglomerate. A small area in Texas and western Oklahoma is underlain by gypsum. Throughout most of the region the rock layers are horizontal or gently dipping. Principal exceptions are the Valley and Ridge section of the Wichita and Arbuckle Mountains in Oklahoma, and the Ouachita Mountains in Oklahoma and Arkansas, in all of which the rocks have been folded and extensively faulted. Around the Black Hills and along the eastern side of the Rocky Mountains the rock layers have been bent up sharply toward the mountains and truncated by erosion. The Triassic Basins in Virginia and North Carolina are underlain by anderate to gently dipping beds of shale and sandstone that have been extensively faulted and invaded by narrow bodies of igneous rock. These basins were formed in Triassic time when major faults in the crystalline rocks of the Piedmont resulted in the formation of structural depressions up to several thousand meters deep and more than 25 km wide and 140 km long.

The land surface in most of the region is underlain by regolith formed by chemical and mechanical breakdown of the bedrock. In the western part of the Great Plains the residual soils are overlain by or intermixed with eclian (wind-laid) deposits. The thickness and composition of the regolith depend on the composition and structure of the parent rock and on the climate, land cover, and topography. In areas underlain by relatively pure limestone, the regolith consists mostly of clay and is generally only a few meters thick. Where the limestones contain chert and in areas underlain by shale and sandstone, the regolith is thicker, up to 30 m or more in some areas. The

8. PIEDMONT BLUE RIDGE GROUND-WATER REGION





8A	Mountain Slopes
8B	Alluvial Mountain Valleys
8C	Mountain Flanks
8D	Regolith
8E	River Alluvium
8F	Mountain Crests
8G	Swamp/Marsh

8. PIEDMONT BLUE RIDGE REGION

(Thick regolith over fractured crystalline and metamorphosed sedimentary rocks)

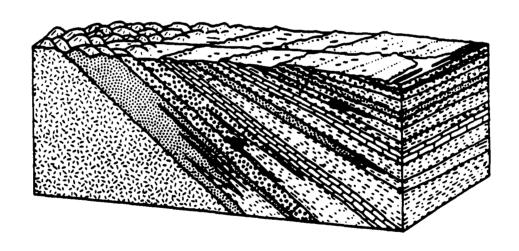
The Piedmont and Blue Ridge region is an area of about 247,000 km2 extending from Alabama on the south to Pennsylvania on the north. The Piedmont part of the region consists of low, rounded hills and long, rolling, northeast-southwest trending ridges whose summits range from about a hundred meters above sea level along its eastern boundary with the Coastal Plain to 500 to 600 m along its boundary with the Blue Ridge area to the west. The Blue Ridge is mountainous and includes the highest peaks east of the Mississippi. The mountains, some of which reach altitudes of more than 2,000 m, have smooth-rounded outlines and are bordered by well-graded streams flowing in relatively narrow valleys.

The Piedmont and Blue Ridge region is underlain by bedrock of Precambrian and Paleozoic age consisting of igneous and metamorphosed igneous and sedimentary rocks. These include granite, gneiss, schist, quartzite, slate, marble, and phyllite. The land surface in the Piedmont and Blue Ridge is underlain by clay-rich, unconsolidated material derived from in situ weathering of the underlying bedrock. This material, which averages about 10 to 20 m in thickness and may be as much as 100 m thick on some ridges, is referred to as saprolite. In many valleys, especially those of larger streams, flood plains are underlain by thin, moderately well-sorted alluvium deposited by the streams. When the distinction between saprolite and alluvium is not important, the term regolith is used to refer to the layer of unconsolidated deposits.

The regolith contains water in pore spaces between rock particles. The bedrock, on the other hand, does not have any significant intergranular porosity. It contains water, instead, in sheetlike openings formed along fractures (that is, breaks in the otherwise "solid" rock). The hydraulic conductivities of the regolith and the bedrock are similar and range from about 0.001 to 1 m day-1. The major difference in their water-bearing characteristics is their porosities, that of regolith being about 20 to 30 percent and that of the bedrock about 0.01 to 2 percent. Small supplies of water adequate for domestic needs can be obtained from the regolith through large-diameter bored or dug wells. However, most wells, especially those where moderate supplies of water are needed, are relatively small in diameter and are cased through the regolith and finished with open holes in the bedrock. Although, as noted, the hydraulic conductivity of the bedrock is similar to that of the regolith, bedrock wells generally have much larger yields than regolith wells because, being deeper, they have a much larger availble drawdown.

10. ATLANTIC AND GULF COASTAL PLAIN GROUND-WATER REGION





10Aa	Regional Aquifers
10Ab	Unconsolidated & Semi-Consolidated
	Shallow Surficial Aquifer
10Ba	River Alluvium With Overbank Deposits
10 B b	River Alluvium Without Overbank Deposits
10C	Swamp

10. ATLANTIC AND GULF COASTAL PLAIN

(Complexly interbedded sand, silt, and clay)

The Atlantic and Gulf Coastal Plain region is an area of about 844,000 km² extending from Cape Cod, Massachusetts, on the north to the Rio Grande in Texas on the south. This Region does not include Florida and parts of the adjacent States; although those areas are a part of the Atlantic and Gulf Coastal Plain physiographic province, they together form a separate ground-water region. (See region 11, "Southeast Coastal Plain").

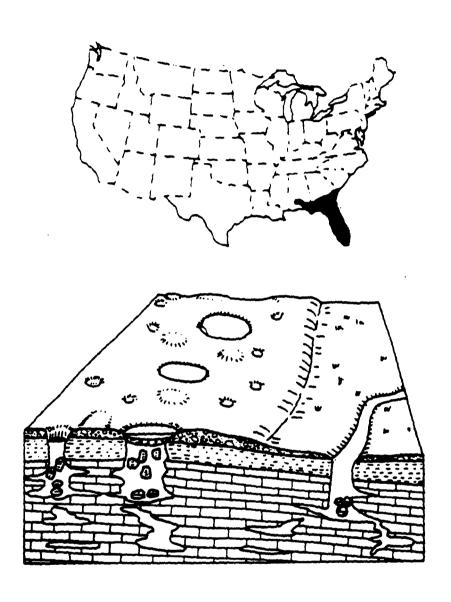
The Atlantic and Gulf Coastal Plain region ranges in width from a few kilometers near its northern end to nearly a thousand kilometers in the vicinity of the Mississippi River. The great width near the Mississippi reflects the effect of a major downwarped zone in the Earth's crust that extends from the Gulf of Mexico to about the confluence of the Mississippi and Ohio Rivers. This area is referred to as the Mississippi embayment.

The topography of the region ranges from extensive, flat, coastal swamps and marshes 1 to 2 m above sea level to rolling uplands, 100 to 250 m above sea level, along the inner margin of the region.

The region is underlain by unconsolidated sediments that consist principally of sand, silt, and clay transported by streams from the adjoining uplands. These sediments, which range in age from Jurassic to the present, range in thickness from less than a meter near the inner edge of the region to more than 12,000 m in southern Louisiana. The greatest thicknesses are along the seaward edge of the region and along the axis of the Mississippi embayment. The sediments were deposited on floodplains and as deltas where streams reached the coast and, during different invasions of the region by the sea, were reworked by waves and ocean currents. Thus, the sediments are complexly interbedded to the extent that most of the named geologic units into which they have been divided contain layers of the different types of sediment that underlie the region. These named geologic units (or formations) dip toward the coast or toward the axis of the Mississippi embayment, with the result that those that crop out at the surface form a series of bands roughly parallel to the coast or to the axis of the embayment. The oldest formations crop out along the inner margin of the region, and the youngest crop out in the coastal area.

Within any formation the coarsest grained materials (sand, at places interbedded with thin gravel layers) tend to be most abundant near source areas. Clay and silt layers become thicker and more numerous downdip.

11. SOUTHEAST COASTAL PLAIN GROUND-WATER REGION



11A	Solution Limestone and Shallow Surficial	1
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118	Coastal Deposits	
110	Swamp	
110	Beaches & Bars	

11. SOUTHEAST COASTAL PLAIN

(Thick layers of sand and clay over semi-consolidated carbonate rocks)

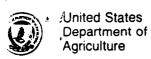
The Southeast Coastal Plain is an area of about 212,000 km² in Alabama, Florida, Georgia, and South Carolina. It is a relatively flat, low-lying area in which altitudes range from sea level at the coast to about 100 m down the center of the Florida peninsula and as much as 200 m on hills in Georgia near the interior boundary of the region. Much of the area, including the Everglades in southern Florida, is a nearly flat plain less than 10 m above sea level.

The land surface of the Southeast Coastal Plain is underlain by unconsolidated deposits of Pleistocene age consisting of sand, gravel, clay, and shell beds and, in southeastern Florida, by semiconsolidated limestone. From the coast up to altitudes of nearly 100 m, the surficial deposits are associated with marine terraces formed when the Coastal Plain was inundated at different times by the sea. In most of the region the surficial deposits rest on formations, primarily of middle to late Miocene age, composed of interbedded clay, sand, and limestone. The most extensive Miocene deposit is the Hawthorn Formation. The formations of middle to late Miocene age and, where those formations are absent, the surficial deposits overlie semiconsolidated limestones and dolomites that are as much as 1,500 m thick. These carbonate rocks range in age from early Miocene to Paleocene and are generally referred to collectively as Tertiary limestones.

The Tertiary limestone that underlies the Southeast Coastal Plain constitutes one of the most productive aquifers in the United States and is the feature that justifies treatment of the region separately from the remainder of the Atlantic and Gulf Coastal Plain. The aquifer, which is known as the Floridan aquifer, underlies all of Florida and southeast Georgia and small areas in Alabama and South Carolina. The Floridan aquifer consists of layers several meters thick composed largely of loose aggregations of shells of foraminifers and fragments of echinoids and other marine organisms interbedded with much thinner layers of cemented and cherty limestone. The Floridan, one of the most productive aquifers in the world, is the principal source of ground-water supplies in the southeast Coastal Plain region.

In southern Florida, south of Lake Okeechobee, and in a belt about 30 km wide northward along the east coast of Florida to the vicinity of St. Augustine, the water in the Floridan aquifer contains more than 100 mg/l of chloride. In this area, most water supplies are obtained from surficial aquifers, the most notable of which underlies the southeastern part of Florida and which in the Miami area consists of 30 to 100 m of cavernous limestone and





Soil Conservation Service In Cooperation with University of Florida. Institute of Food and Agricultural Sciences, Agricultural Experiment Stations and Soil Science Department, and Florida Department of Agriculture and Consumer Services

Manatee County Florida



This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was done prior to November 1952, when the soil survey program was administered by the Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration. The first soil survey of Manatee County was issued in December 1958. In 1980, the soils were recorrelated, and data were revised and updated for this soil survey. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1980. This survey was made cooperatively by the Soil Conservation Service and the University of Florida, Institute of Food and Agricultural Sciences, Agricultural Experiment Stations and Soil Science Department, and the Florida Department of Agriculture and Consumer Services. It is part of the technical assistance furnished to the Manatee River Soil and Water Conservation District. The Manatee County Board of Commissioners contributed financially to this soil survey.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: Many of the soils in Manatee County are used for crop production. The main crops are citrus and tomatoes.

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Issued April 1983

these soils have a spodic horizon. EauGallie, Myakka, Wabasso, and Wauchula soils are poorly drained, and Pomello soils are moderately well drained. Cassia, Pomello, and Zolfo soils have a spodic horizon and are sandy to a depth of 80 inches or more.

Typical pedon of Braden fine sand, in woodland, about 2 miles southwest of Lorraine and three-fourths of a mile south of Florida Highway 70, NW1/4SW1/4 sec. 21, T. 35 S., R. 19 E.

- A1—0 to 4 inches; very dark gray (10YR 3/1) rubbed fine sand; weak fine granular structure; very friable; common fine roots; very strongly acid; clear smooth boundary.
- A21—4 to 6 inches; grayish brown (10YR 5/2) fine sand; single grained; loose; common fine roots; very strongly acid; clear wavy boundary.
- A22—6 to 10 inches; brown (10YR 5/3) fine sand; single grained; loose; few fine roots; very strongly acid; clear wavy boundary.
- A23—10 to 18 inches; dark brown (10YR 4/3) fine sand; single grained; loose; few fine roots; strongly acid; clear wavy boundary.
- A24—18 to 24 inches; light yellowish brown (10YR 6/4) fine sand; common fine faint very pale brown mottles; single grained; loose; very strongly acid; gradual wavy boundary.
- B1—24 to 28 inches; yellow (10YR 7/6) fine sand; common fine distinct strong brown (7.5YR 5/6) segregated iron mottles; single grained; loose; very strongly acid; clear wavy boundary.
- B21t—28 to 36 inches; yellowish brown (10YR 5/8) fine sandy loam; common fine and medium distinct light gray (10YR 7/1; 7/2) and common fine faint strong brown and yellowish red mottles; weak coarse subangular blocky structure; friable; sand grains bridged and coated with clay; extremely acid; gradual wavy boundary.
- B22t—36 to 40 inches; yellowish brown (10YR 5/8) fine sandy loam; many medium distinct light gray (10YR 7/2) and common fine faint strong brown and yellowish red mottles; weak coarse subangular blocky structure; friable; sand grains coated and bridged with clay; few thin lenses of loamy fine sand; extremely acid; gradual wavy boundary.
- B3—40 to 44 inches; very pale brown (10YR 7/4) loamy fine sand; many medium distinct light gray (10YR 7/2) and many fine faint strong brown mottles; moderate medium granular structure; very friable; extremely acid; clear wavy boundary.
- C1g—44 to 50 inches; light gray (10YR 7/2) fine sand; few fine distinct brownish yellow (10YR 6/8) mottles; single grained; loose; extremely acid; gradual wavy boundary.
- C2g—50 to 55 inches; light brownish gray (10YR 6/2) fine sand; few medium faint light gray (10YR 7/2) mottles; single grained; loose; clear wavy boundary.

C3g—55 to 70 inches; gray (10YR 5/1) sand; many coarse distinct light gray (10YR 7/2) mottles; single grained; loose; very strongly acid.

The solum ranges from 40 to 60 inches in thickness. The A horizon is very strongly acid or strongly acid. The Bt and C horizons range from extremely acid to strongly acid.

The A1, or Ap, horizon has hue of 10YR, value of 2, and chroma of 1 or value of 3 or 4 and chroma of 1 to 3. It is less than 10 inches thick where value is 3 or less and chroma is 2 or 1.

The A21 horizon has hue of 10YR, value of 5 to 7, and chroma of 2. The A22 to A24 horizons have hue of 10YR, value of 5 or 6, and chroma of 3 to 6; or value of 4 and chroma of 3 or 4; or value of 7 and chroma of 3 or 4. In some pedons there are few to common mottles or splotches of uncoated sand grains that have chroma of 2 or 1. The A horizon is sand or fine sand. There is no A21 horizon in some pedons.

The B1 horizon has hue of 10YR or 7.5YR, value of 5 to 7, and chroma of 4 to 8. It is sand, fine sand, loamy sand, or loamy fine sand. There is no B1 horizon in some pedons.

The B2t horizon has hue of 10YR, value of 5 to 7, and chroma of 3 to 8; or hue of 7.5YR, value of 5, and chroma of 4 or 6; or value of 6 and chroma of 4 to 8 and few to many mottles that have chroma of 2 or less. There are mottles of higher value and chroma in many pedons. The horizon is sandy loam, fine sandy loam, or sandy clay loam. In some pedons there are a few streaks or lenses of coarser textured material. The mottles that have chroma of 2 are at a depth of less than 30 inches. They indicate wetness.

In some pedons the lower part of the B2t horizon has hue of 10YR, value of 4 to 7, and chroma of 2 or 1; or hue of 2.5Y, value of 4 to 7, and chroma of 2; or hue of 5Y, value of 5 or 6, and chroma of 1; or it has no hue (N), value is 4 to 7, and in some pedons, there are mottles of red, yellow, brown, or gray. The texture is sandy loam, fine sandy loam, or sandy clay loam.

The B3 horizon has hue, value, and chroma that are similar to those of the B2t horizon. It ranges from fine sandy loam to loamy sand. There is no B3 horizon in some pedons.

The Cg horizon has hue, value, and chroma similar to those of the lower part of the B2t horizon. It is sand or fine sand.

Bradenton series

The Bradenton series consists of poorly drained, moderately permeable soils that formed in unconsolidated loamy marine sediment underlain by marl and, in some places, hard limestone. The soils are nearly level and are on low-lying ridges and hammocks. Slopes are generally smooth and are less than 2 percent. In most years, if the soils are not drained, the water table is

within 10 inches of the surface for 2 to 6 months out of the year and at a depth of 10 to 40 inches for much of the rest of the year. In dry periods the water table recedes to a depth below 40 inches. These soils are coarse-loamy, siliceous, hyperthermic Typic Ochraqualfs.

Bradenton soils are near Chobee. Delray, EauGallie, Felda, Floridana, Manatee, Wabasso. and Waveland soils. Chobee soils are fine-loamy. Delray and Floridana soils have a mollic epipedon and an A horizon that is more than 20 inches thick. EauGallie, Wabasso, and Waveland soils have a spodic horizon. Felda soils have an A horizon that is 20 to 40 inches thick. Manatee soils have a mollic epipedon.

Typical pedon of Bradenton fine sand, in a hardwood-cabbage palm hammock, about one-eighth mile east of the Sarasota County line along the north boundary of the Myakka River State Park, SW1/4NW1/4 sec. 6, T. 37 S., R. 21 E.

- A1—0 to 4 inches; dark gray (10YR 4/1) fine sand; moderate medium granular structure; very friable; many fine and medium roots; medium acid; clear smooth boundary.
- A2—4 to 9 inches; grayish brown (10YR 5/2) fine sand; few medium distinct dark gray (10YR 4/1) mottles; single grained; loose; many fine and medium roots; medium acid; abrupt wavy boundary.
- B21tg—9 to 20 inches; dark gray (10YR 4/1) fine sandy loam; common fine and medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; common fine and medium roots; few thin discontinuous clay films on surface of peds; slightly acid; gradual wavy boundary.
- B22tg—20 to 27 inches; gray (10YR 5/1) fine sandy loam; many fine distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; few thin discontinuous clay films on surface of peds; common soft white calcium carbonate accumulations; mildly alkaline; gradual wavy boundary.
- B3g—27 to 38 inches; gray (10YR 5/1) loamy fine sand; weak coarse subangular blocky structure; very friable; many sand grains coated with white calcium carbonate, few white calcium carbonate nodules; mildly alkaline, calcareous; clear wavy boundary.
- C—38 to 80 inches; light gray (10YR 7/1) marl that has texture of loamy fine sand; massive; friable; moderately alkaline, calcareous.

The solum ranges from 20 to 50 inches in thickness. The A1, or Ap, norizon has hue of 10YR, value of 2 to 4, and chroma of 1; or it has no hue (N) and value of 2 to 4. It ranges from medium acid to neutral and ranges from 4 to 6 inches in thickness.

The A2 horizon has hue of 10YR, value of 4 to 7, and chroma of 1; or value of 5 to 7 and chroma of 2; or it

has no hue (N) and value of 4 to 7 and mottles of gray, brown, or yellow. Reaction ranges from medium acid to neutral. The total thickness of the A horizon is less than 20 inches.

The B2tg horizon has hue of 10YR, value of 4 to 7, and chroma of 1; or hue of 10YR or 2.5Y, value of 3 to 7, and chroma of 2; or it has no hue (N) and value of 4 to 7 and, in places, mottles of brown, yellow, or red. The horizon is sandy loam or fine sandy loam, and it ranges from slightly acid to mildly alkaline. In many pedons the lower part of the horizon has soft calcium carbonate accumulations and nodules. The B3g horizon is similar in color to the B2tg horizon. It is loamy sand or loamy fine sand and is mildly alkaline or moderately alkaline. In some places there is no B3g horizon.

The C horizon has hue of 10YR to 5GY, value of 5 to 8, and chroma of 2 or 1. It is predominantly marl that has texture of loamy sand or loamy fine sand. However, in some pedons the C horizon is a mixture of shells, shell fragments, and sand.

In some pedons a layer of limestone about 1.5 to 3 feet thick underlies the Btg, B3g, or C horizons at a depth between 40 and 80 inches. The limestone can be dug with a backhoe. It has few to common solution holes or fractures. Below the limestone there is variable sand to sandy clay loam mixed with shells and shell fragments.

Broward Variant

Broward Variant soils are poorly drained and moderately permeable. They formed in sandy marine sediment overlying limestone. These soils are nearly level and are in moderately large to small areas of flatwoods, mainly in the western part of the county. Slopes are 0 to 2 percent. In most years, if the soils are not drained, the water table is between depths of 10 and 40 inches for more than 6 months of the year. It is at a depth of less than 10 inches for 1 to 4 months in wet seasons and recedes to a depth below 40 inches in very dry seasons. These soils are sandy, siliceous, hyperthermic Entic Haplaquods.

Broward Variant soils are near Chobee. Delray, EauGallie, Myakka, and Wabasso Variant soils. All the associated soils except Wabasso Variant soils do not have limestone within a depth of 80 inches. Chobee and Delray soils have a moilic epipedon, do not have a spodic horizon, and have an argillic horizon. EauGallie soils have an argillic horizon below a depth of 40 inches. Myakka soils have a spodic horizon that is better developed than that of Broward Variant soils. Wabasso Variant soils have an argillic norizon between the spodic horizon and limestone.

Typical pedon of Broward Variant fine sand, in a partly cleared area, about 2 miles west of Oneco and about 1,000 feet north of 53rd Ave., SW1/4SW1/4 sec. 11, T. 35 S., R. 17 E.

- B22tca—24 to 44 inches; very dark gray (10YR 3/1) sandy clay loam; weak coarse subangular blocky structure; friable; sticky and plastic; few fine roots: many soft white calcium carbonate accumulations; sand grains coated and bridged with clay; moderately alkaline, calcareous; gradual wavy boundary.
- B23tca—44 to 51 inches; dark gray (10YR 4/1) sandy clay loam; few fine distinct yellowish brown (10YR 5/4) and strong brown (7.5YR 5/8) mottles; weak coarse subangular blocky structure; friable; sticky and plastic; sand grains coated and bridged with clay; many fine and medium white calcium carbonate accumulations; moderately alkaline, calcareous; gradual wavy boundary.
- B3g—51 to 63 inches; gray (10YR 5/1) fine sandy loam; common medium distinct yellowish brown (10YR 5/4) mottles; massive; friable; common calcium carbonate nodules; moderately alkaline, calcareous; gradual wavy boundary.
- Cg—63 to 80 inches: gray (10YR 6/1) loamy fine sand and fine sand; massive; very friable; few small calcium carbonate nodules; moderately alkaline, calcareous.

The solum is more than 40 inches thick.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. Reaction ranges from slightly acid to moderately alkaline. Thickness ranges from 4 to 18 inches.

The B2t and B2tca horizons have no hue (N) or have hue of 10YR; value is 2 through 5, and chroma is 1 or 0; or they have hue of 5YR, value of 4 through 6, and chroma of 1 or 2 and, in some pedons, mottles of gray or brown; or they have hue of 2.5Y, value of 4 or 5, and throma of 2 and mottles. Texture is sandy loam or sandy clay loam. Clay content in the upper 20 inches of the arquilic horizon ranges from 18 to 35 percent. In the Btca norizon, reaction ranges from neutral to moderately alkaline and calcareous.

The B3g horizon has the same color range as the B2t and B2tca horizons. Its texture is sandy loam or fine sand loam. The horizon has pockets or lenses of coarser material in some places.

The Cg horizon has hue of 10YR, value of 5 through Tand proma of 1 hue of 2.5Y, value of 5 through 7 and chroma of 2; hue of 5Y, value of 5 through 7, and chroma of 1 or 2; or hue of 5GY, value of 5 or 6, and chroma of 1 and, in some pedons, mottles. Its texture ranges from fine sand or loamy fine sand to clay loam. Reaction ranges from neutral to moderately alkaline and Laicarebus. There are shell fragments in some pedons.

Chobee Variant

Chobee Variant soils are very poorly drained, slowly permeable soils that formed in thick beds of alkaline

loamy marine sediment. These soils are nearly level and are in shallow depressions mainly in the western part of the county. The water table is at a depth of less than 10 inches for 6 months or more of the year. Undrained areas pond for long periods. Slopes range from 0 to 2 percent. These soils are fine-loamy, carbonatic, hyperthermic Typic Haplaquolls.

Chobee Variant soils are near Bradenton, Chobee, Felda, and Manatee soils. Bradenton soils do not have a mollic epipedon and are poorly drained. Chobee soils have an argillic horizon. Felda soils are poorly drained and have an argillic horizon below a depth of 20 inches. Manatee soils have a sandy loam argillic horizon.

Typical profile of Chobee Variant sandy clay loam, in a wooded area, 100 feet east of Cedar Drain and one-half mile south of Atlantic Coast Line Railroad, SE1/4NE1/4 sec. 28, T. 33 S., R. 18 E.

- A11—0 to 13 inches; black (10YR 2/1) sandy clay loam: weak medium subangular blocky structure; firm: high in organic matter; few fine and medium roots; neutral; clear wavy boundary.
- A12—13 to 20 inches: very dark gray (10YR 3/1) sandy clay loam; weak medium subangular blocky structure; common fine faint very dark grayish brown mottles; firm; few fine and medium roots; neutral; clear wavy boundary.
- B2gca—20 to 35 inches; light gray (10YR 7/2) sandy clay loam; common fine distinct dark gray (10YR 4/1) mottles; moderate medium subangular blocky structure; sticky; soft accumulations of calcium carbonate; moderately alkaline, calcareous; clear wavy boundary.
- B3gca—35 to 40 inches; light gray sandy loam; common medium distinct yellow (10YR 7/6) mottles; weak fine subangular blocky structure; slightly sticky; soft accumulations of calcium carbonate; moderately alkaline, calcareous; clear wavy boundary.
- C1g—40 to 70 inches; light gray (10YR 7/2) leamy sand, weak medium granular structure; few fine shell fragments; very friable; moderately alkaline, calcareous; clear wavy boundary.
- C2g—70 to 80 inches; mixed light gray (10YR 7/2) and brownish yellow (10YR 6/6) sand; single grained; loose; common shell fragments; moderately alkaline, calcareous

The solum ranges from 35 to 60 inches in thickness. Base saturation is 50 percent or more in all horizons. The mollic epipedon is 10 to 24 inches thick.

The A horizon has no hue (N) or has hue of 10YA: aida is 2 or 1, and phroma is 1 or 3. Reaction randas from medium acid to neutral.

The Bgca horizon has no hue (N) or has hue of 10YP: value is 5 to 7, and chroma is 2 to 0. The texture is mainly sandy clay loam or sandy clay but ranges to sandy loam in the lower part. The content of clay in the

10- to 40-inch control section averages 20 to 35 percent. Reaction is mildly alkaline or moderately alkaline. There are few to common mottles in shades of yellow or brown.

The Cg horizon has no hue (N) or has hue of 10YR; value is 5 to 7, and chroma is 2 to 0. The texture is sand or loamy sand. Carbonatic accumulations are common in some pedons. Shell fragments range from few to common.

Delray series

The Delray series consists of very poorly drained soils that formed in marine sandy and loamy material. Permeability is moderate or moderately rapid. The soils are nearly level and are in low shallow depressions. In most years, if the soils are not drained, the water table is at or slightly above the surface for more than 6 months of the year. Slopes are less than 2 percent. These soils are loamy, mixed, hyperthermic Grossarenic Argiaquolls.

Delray soils are near Bradenton, Felda, Floridana, EauGallie, Manatee, Myakka, Ona, Pomona, and Waveland soils. Bradenton soils do not have a mollic epipedon but have an argillic horizon at a depth of less than 20 inches. Felda soils do not have a mollic epipedon but have an argillic horizon at a depth between 20 and 40 inches. Floridana soils have an argillic horizon at a depth between 20 and 40 inches. Manatee soils have an argillic horizon at a depth of less than 20 inches. EauGallie, Myakka, Ona, Pomona, and Waveland soils have a spodic horizon and are better drained than Delray soils.

Typical pedon of Delray mucky loamy fine sand, in a wooded area, about 2.5 miles east of the Sarasota County line and 0.75 mile south of Florida Highway 18, NW1/4NE1/4 sec. 16, T. 37 S., R. 21 E.

- A11—0 to 8 inches; black (N 2/0) mucky loamy fine sand; weak medium granular structure; very friable; common fine and medium roots; neutral; gradual smooth boundary.
- A12—8 to 16 inches; black (10YR 2/1) loamy fine sand; few fine faint dark gray mottles; weak medium granular structure; very friable; many fine roots; neutral; clear wavy boundary.
- A21—16 to 21 inches; grayish brown (10YR 5/2) fine sand; common medium distinct very dark gray (10YR 3/1) streaks and mottles; single grained; loose; common fine and few medium roots; neutral; clear wavy boundary.
- A22—21 to 43 inches; light brownish gray (10YR 6/2) fine sand; common medium distinct dark gray (10YR 4/1) mottles and very dark gray (10YR 3/1) streaks along old root channels; single grained; loose; common fine and few medium roots; neutral; clear wavy boundary.

- A23—43 to 48 inches; grayish brown (10YR 5/2) fine sand; single grained; loose; few fine roots; neutral; clear wavy boundary.
- B21tg—48 to 51 inches; grayish brown (2.5Y 5/2) fine sandy loam; weak medium subangular blocky structure; friable; sand grains coated and bridged with clay; few fine roots; mildly alkaline; clear wavy boundary.
- B22tg—51 to 66 inches; grayish brown (2.5Y 5/2) sandy clay loam; few fine distinct yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; firm; few clay films on ped surfaces; neutral; gradual wavy boundary.
- B23tg—66 to 75 inches; greenish gray (5GY 6/1) sandy clay loam; common medium distinct olive brown (2.5Y 4/4) mottles; moderate medium subangular blocky structure; firm; clay films on ped surfaces; neutral; clear wavy boundary.
- B24tg—75 to 80 inches; grayish brown (2.5Y 5/2) sandy clay loam; few fine faint light gray mottles; weak medium subangular blocky structure; firm; few clay films on ped surfaces; common fine sand lenses between peds; neutral.

Reaction ranges from medium acid to neutral in the A horizon and from neutral to mildly alkaline in the Btg horizon.

The A1 horizon has hue of 10YR, value of 3 or less, and chroma of 2 or 1; or it has no hue (N) and value of 2 or 3. The content of organic matter ranges from about 2 to 18 percent. The horizon ranges from 10 to 24 inches in thickness.

The A2 horizon has hue of 10YR or 2.5YR, value of 4 to 7, and chroma of 2; or it has hue of 10YR, value of 4 to 7, and chroma of 1; or it has no hue (N) and value of 4 to 7. The texture is fine sand or sand. The horizon ranges from 27 to 55 inches in thickness.

The B2tg horizon has hue of 10YR to 5GY, value of 4 to 6, and chroma of 1; or hue of 10YR, value of 4 to 6, and chroma of 2; or it has no hue (N), and value is 4 to 6. It has mottles of brown, yellow, or olive in some pedons. Its texture is fine sandy loam or sandy clay loam.

The B3g horizon is similar in color to the B2tg horizon. Its texture is loamy sand or loamy fine sand. There is no B3g horizon in some pedons.

Duette series

The Duette series consists of moderately well drained soils that formed in thick deposits of marine sand. Permeability is moderately rapid. The soils are nearly level to gently sloping and are on low ridges and knolls in flatwoods. In most years, if the soils are not drained, the water table is at a depth of 48 to 72 inches for 1 to 4 months during the wet season. It is at a depth of more than 72 inches for the rest of the year. Slopes range

from 0 to 5 percent. These soils are sandy, siliceous, hyperthermic Grossarenic Entic Haplohumods.

Duette soils are near Cassia, Myakka, and Pomello soils. Cassia and Myakka soils have a spodic horizon at a depth of less than 30 inches. Cassia soils are somewhat poorly drained, and Myakka soils are poorly drained. Pomello soils have a spodic horizon at a depth between 30 and 50 inches.

Typical pedon of Duette fine sand, 0 to 5 percent slopes, in an area of sand scrub, approximately 2.25 miles east of the northeast corner of the Myakka River State Park, SW1/4SW1/4SW1/4 sec. 3, T. 37 S., R. 21 E.

- A1—0 to 4 inches; very dark gray (10YR 3/1) rubbed, salt and pepper appearance unrubbed, fine sand; weak fine granular structure; friable; many fine and medium roots; strongly acid; clear smooth boundary.
- A21—4 to 12 inches; light gray (10YR 7/2) fine sand; single grained; loose; few fine and coarse roots: slightly acid; clear smooth boundary.
- A22—12 to 58 inches; white (10YR 8/1) fine sand; single grained; loose; few fine and coarse roots; slightly acid; clear smooth boundary.
- B21h—58 to 64 inches; dark brown (7.5YR 3/2) fine sand; weak medium subangular blocky structure; friable; sand grains well coated with organic matter; few fine roots; strongly acid; clear wavy boundary.
- B22h—64 to 80 inches; black (5YR 2/1) fine sand; weak medium subangular blocky structure; friable; many fine and medium roots; strongly acid.

Reaction ranges from slightly acid to strongly acid throughout. Texture is sand or fine sand in all horizons.

The A1 horizon has hue of 10YR, value of 3 to 5, and chroma of 1 or 2. Unrubbed material has a salt and pepper appearance. Thickness ranges from 2 to 6 inches.

The A2 horizon has hue of 10YR, value of 6 to 8, and chroma of 1 or 2. Combined thickness of the A1 and A2 horizons ranges from 51 to 75 inches.

The Bh horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2; or hue of 7.5YR, value of 3, and chroma of 2; or hue of 5YR, value of 2 or 3, and chroma of 1 to 4.

TauCallie peries

The EauGallie series consists of poorly drained soils that formed in thick beds of sandy and loamy marine sediment. Permeability is moderate to moderately rapid. The soils are nearly level and are in broad areas of atwoods and, in some places, in slightly decreased areas. In most years, a water table is at a depth of less than 10 inches for 2 to 4 months in wet seasons and at a depth of less than 40 inches for more than 6 months of the year. Slopes range from 0 to 2 percent. These soils are sandy, siliceous, hyperthermic Alfic Haplaquods.

EauGallie soils are near Delray, Pinellas, and Wabasso soils. Delray soils are very poorly drained, have a mollic epipedon, and do not have a spodic horizon. Pinellas soils do not have a spodic horizon. Wabasso soils have an argillic horizon at a lesser depth.

Typical pedon of EauGallie fine sand, in a pasture, about 2.5 miles west of Foxleigh and 3.25 miles southeast of the Manatee River, SW1/4NE1/4 sec. 26, T. 34 S., R. 18 E.

- Ap—0 to 5 inches; very dark gray (10YR 3/1) fine sand; weak fine granular structure; very friable; many fine roots; mixture of light gray sand grains and black organic matter granules; very strongly acid; gradual wavy boundary.
- A21—5 to 12 inches; grayish brown (10YR 5/2) fine sand; single grained; loose; few fine roots; very strongly acid: gradual wavy boundary.
- A22—12 to 28 inches; light brownish gray (10YR 6/2) fine sand; single grained; loose; few fine roots; few medium distinct grayish brown (10YR 5/2) mottles; very strongly acid; abrupt wavy boundary.
- B2h—28 to 42 inches: black (5YR 2/1) fine sand: massive in place, crushes to moderate medium granular structure; friable sand grains coated with organic matter; few fine roots; very strongly acid; clear wavy boundary.
- B2tg—42 to 50 inches; grayish brown (2.5Y 5/2) sandy clay loam; moderate medium subangular blocky structure; firm and slightly sticky; few fine roots; sand grains coated and bridged with clay; slightly acid; gradual wavy boundary.
- C—50 to 65 inches; mixed lenses and pockets of grayish brown (10YR 5/2) fine sand, loamy fine sand, and fine sandy loam; massive; friable; few pockets of grayish brown (2.5Y 5/2) sandy clay loam; slightly acid.

The solum is more than 46 inches thick. The A horizon is less than 30 inches thick. The Btg horizon is at a depth of more than 40 inches. The A and Bh horizons are sand or fine sand.

The A1 horizon has hue of 10YR, value of 2 to 4, and chroma of 1. It ranges from 3 to 9 inches in thickness. The A2 horizon has hue of 10YR, value of 5 to 8, and chroma of 2 or 1. The A horizon is very strongly or strongly acid.

The B2h horizon has no hue (N) and value of 2: or hue of 10YR or 5YR, value of 2, and chroma of 1 or 2: or hue of 5YR and 7.5YR, value of 3, and chroma of 2: or hue of 5YR, value of 3, and chroma of 3. The sand grains are coated with organic matter. Praction ranges from very strongly acid to slightly acid. The B3 horizon has hue of 10YR, value of 3 to 6, and chroma of 3. It consists of sand or fine sand. It is commonly below the Bh horizon. The A'2 horizon has hue of 10YR, value of 4 or 5, and chroma of 1: or hue of 10YR or 2.5Y, value of

÷ ;

5 or 6, and chroma of 2. There is no A'2 horizon in some pedons.

The B2tg horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 or 1. In some pedons it has mottles in shades of brown, yellow, or gray. Its texture is sandy loam or sandy clay loam. There are pockets of sand or loamy sand. Reaction is medium acid to mildly alkaline.

The C horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 or 1. In some pedons it has mottles in shades of yellow or brown. Its texture is fine sand, loamy fine sand, or sandy loam. The horizon has pockets of finer textured material in some pedons. Reaction is slightly acid to mildy alkaline.

Estero series

The Estero series consists of very poorly drained soils that formed in thick deposits of sandy marine sediment under conditions favorable for the accumulation of organic material. Permeability is moderately rapid. These soils are nearly level and are in tidal mangrove swamps. Slopes are less than 1 percent. These soils are flooded daily by high tides. The water table is above the surface or just below the surface, depending on the tide. These soils are sandy, siliceous, hyperthermic Typic Haplaquods.

Estero soils are near Wulfert and Kesson soils in tidal swamps and Myakka, Delray, Bradenton, and St. Johns soils on uplands. Wulfert soils are organic. Kesson soils do not have a spodic horizon. Myakka, Delray, Bradenton, and St. Johns soils do not have a histic epipedon. Delray soils have a mollic epipedon, do not have a spodic horizon, and have an argillic horizon. Bradenton soils do not have a spodic horizon but have an argillic horizon. St. Johns soils have an umbric epipedon.

Typical pedan of Estero muck, in a mangrove swamp, on Perico Island, SW1/4SE1/4 sec. 27, R. 16 E., T. 34 S

- Oa—0 to 6 inches: black (10YR 2/1) muck; about 90 percent fiber, less than 10 percent rubbed; massive; friable: neutral: abrupt smooth boundary.
- A11—6 to 11 inches; black (N 2/0) fine sand; weak fine plantate curacture, selly mable, many mile leuts, moderately alkaline; clear smooth boundary.
- A12—11 to 14 inches; very dark gray (10YR 3/1) fine sand; weak fine granular structure; very friable; many fine roots; moderately alkaline; clear wavy surgan.
- A21—14 to 20 inches: light brownish gray (10YR 6/2) fine sand: few fine distinct yellowish red (5YR 5/8) mottles; single grained: loose; few fine roots; moderately alkaline; clear wavy boundary.

- A22—20 to 31 inches; grayish brown (10YR 5/2) fine sand; few medium distinct yellowish red (5YR 5/6) mottles; single grained; loose; few very fine roots; mildly alkaline; abrupt wavy boundary.
- B21h—31 to 41 inches: black (5YR 2/1) and dark grayish brown (10YR 4/2) fine sand: massive: very friable: sand grains thinly coated with organic matter: very strongly acid; clear wavy boundary.
- B22h—41 to 46 inches; black (10YR 2/1) and dark reddish brown (5YR 3/2) fine sand; massive; very friable; sand grains thinly coated with organic matter; very strongly acid; gradual wavy boundary.
- B3—46 to 56 inches; dark brown (10YR 4/3) and black (10YR 2/1) fine sand; massive; very friable; very strongly acid; clear wavy boundary.
- C—56 to 80 inches; grayish brown (10YR 5/2) fine sand; few fine distinct black (10YR 2/1) mottles; single grained; loose; very strongly acid.

Reaction in the Oa and A horizons ranges from neutral to moderately alkaline by field test and from very strongly acid to mildly alkaline after drying. The Bh horizon is strongly acid or very strongly acid. Conductivity of the saturation extract ranges from about 245 to 350 mmho/cm in the Oa horizon and from 15 to 45 mmho/cm in the mineral horizons.

The Oa or Oe horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. In pedons where the Oa or Oe horizon is less than 10 inches thick, there is a histic epipedon if the soil is mixed to a depth of 10 inches.

The A1 horizon has hue of 10YR, value of 2, and chroma of 1; or value of 3 or 4 and chroma of 1 or 2; or hue of 2.5Y, value of 3 or 4, and chroma of 2; or it has no hue (N), and value is 2 to 4. Where value is 3 or less and chroma is 2 or 1, it is less than 10 inches thick even after mixing with the Oa or Oe norizon to a depth or 10 inches. The texture is sand, fine sand, mucky sand, or mucky fine sand.

The A2 horizon has hue of 10YR, value of 5 to 7, and chroma of 1 or 2 and, in some pedons, has brown, yellow, red, or gray mottles and streaks. Its texture is sand or fine sand.

The Bh horizon has hue of 10YR, value of 2, and chroma of 1; or value of 3 and chroma of 1 or 2; or hue of 7.5YR, value of 3, and chroma of 2; or hue of 5YR.

.c.ue 3(2) and chroma 1 or 2, 2, and chroma of 1 to 4. The B21h horizon does not have colors of higher chroma, as described, in all pedons. Texture is sand, fine sand, or loamy fine sand. There are few to common uncoated sand grains in the upper part of the 1972201.

The B3 horizon has hue of 10YR, value of 3, and chroma of 3; or value of 4 and chroma of 2 to 4; or hue of 7.5YR and 5YR, value of 4, and chroma of 2 or 4. Its texture is sand or fine sand.

but in places extends throughout the horizon as small bodies of uncemented fine sand. The B&Bh horizon is 18 to 43 inches thick.

The C horizon has hue of 10YR, value of 6 to 8, and chroma of 1 to 4. It extends to a depth of 80 inches or more.

Palmetto series

The Palmetto series consists of deep, poorly drained soils that formed in thick deposits of sand and loamy marine sediment. Permeability is moderately slow. The soils are nearly level. They are in the flatwoods in sloughs, in poorly defined drainageways, and in depressions. Slopes are less than 2 percent. In most years, if the soils are not drained, the water table is at a depth of 10 inches for 2 to 6 months of the year. In depressions water is ponded for 2 to 6 months of the year. These soils are loamy, siliceous, hyperthermic Grossarenic Paleaguults.

Palmetto soils are near Delray, EauGallie, Wabasso, and Waveland soils. Delray soils have a mollic epipedon and are sandy to a depth of 80 inches or more. EauGallie, Wabasso, and Waveland soils have a spodic horizon. A part of the spodic horizon in Waveland soils is ortstein.

Typical pedon of Palmetto sand, about 2.25 miles north of Verna, SW1/4SW1/4 sec. 24, T. 35 S., R. 20 E.

- A11—0 to 8 inches; black (10YR 2/1) sand; moderate medium granular structure; very friable; many fine roots; extremely acid; clear wavy boundary.
- A12—8 to 10 inches; dark gray (10YR 4/1) sand; common medium distinct gray (10YR 5/1) mottles; single grained; loose; common fine roots; extremely acid; gradual wavy boundary.
- A2—10 to 25 inches; gray (10YR 6/1) sand; common medium distinct gray (10YR 5/1) and light gray (10YR 7/1) mottles; single grained; loose; few fine roots; extremely acid; clear wavy boundary.
- Bh&A2—25 to 30 inches; dark grayish brown (10YR 4/2) sand; many coarse distinct gray (10YR 5/1) mottles consisting of material from the A2 horizon and common medium distinct very dark grayish brown (10YR 3/2) Bh fragments; single grained; loose; many uncoated sand grains; extremely acid; gradual wavy boundary.
- B21h—30 to 40 inches; dark grayish brown (10YR 4/2) sand; common medium faint very dark grayish brown (10YR 3/2) mottles; single grained; loose; many uncoated sand grains; extremely acid; gradual wavy boundary.
- B22h—40 to 45 inches; very dark grayish brown (10YR 3/2) sand; common coarse faint dark grayish brown (10YR 4/2) mottles; single grained; loose; many uncoated sand grains; extremely acid; clear wavy boundary.

- B21tg—45 to 60 inches; grayish brown (2.5Y 5/2) sandy clay loam; few medium distinct yellowish brown (10YR 5/6) and few coarse faint dark grayish brown mottles; weak coarse subangular blocky structure; friable; sand grains moderately coated and bridged with clay; very strongly acid; gradual wavy boundary.
- B22tg—60 to 64 inches; dark grayish brown (2.5Y 4/2) sandy loam; common coarse faint grayish brown (2.5Y 5/2) mottles; weak coarse subangular blocky structure; friable; sand grains moderately coated and bridged with clay; very strongly acid; gradual wavy boundary.
- B3g—64 to 68 inches; dark grayish brown (2.5Y 4/2) loamy sand; massive; friable; very strongly acid.

The B'2tg horizon is at a depth of more than 40 inches. The A and Bh horizons are extremely acid to strongly acid. The B2t, B3g, and Cg horizons are very strongly acid or strongly acid.

The A1, or Ap, horizon has hue of 10YR, value of 1 to 4, and chroma of 2 or 1; or it has no hue (N), and value is 1 to 4. It is as much as 8 inches thick where value is 2 or 3. Its texture is sand or fine sand.

The A2 horizon has no hue (N) or has hue of 10YR or 2.5Y; value is 5 to 7, chroma is 2 to 0, and there are mottles in some pedons; or value is 5, chroma is 2, and there are mottles. Its texture is sand or fine sand.

The Bh&A2 horizon has the same colors as those of the component horizons. There is no Bh&A2 horizon in some pedons.

The B2h horizon does not meet the requirements of a spodic horizon. It mainly has hue of 10YR, value of 3, and chroma of 2 or 3 or value of 4 and chroma of 2 to 4; or hue of 7.5YR, value of 4, and chroma of 2 or 4; but it ranges to hue of 10YR, value of 5, and chroma of 2 to 4 where the A2 horizon has value of 7. Uncoated sand grains in the B2h horizon are common to many. The horizon is sand or fine sand.

The A'2 horizon has hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 3 or less. Its texture is sand or fine sand. There is no A'2 horizon in some pedons.

The B2tg or B'2tg horizon has hue of 10YR or 5Y, value of 4 to 7, and chroma of 1 or 2; or hue of 2.5Y, value of 4 to 7, and chroma of 1 or 2; or hue of 2.5Y, value of 4 to 7, and chroma of 2; or it has no hue (N) and value of 4 to 7, and, in some pedons, mottles of yellow, brown, red, or gray. The control section is sandy loam or sandy clay loam. In some pedons the lower B2tg horizon is sandy clay.

The B3 or B'3g horizon has the same color range as that of the B2tg horizon. It ranges from loamy sand to fine sandy loam.

The Cg horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 to 8, and chroma of 4 or less. It ranges from sand to loamy fine sand. There is no Cg horizon in some pedons.

· 李亚素

yellow mottles in lower 2 inches of horizon; weak medium granular structure; loose; common fine and coarse roots; few fine scattered carbon particles; dark brown staining along root channels; strongly acid; gradual wavy boundary.

- C3—34 to 56 inches; yellowish brown (10YR 5/6) fine sand; weak medium granular structure; loose; few coarse roots; few fine faint gray splotches; sand grains lightly coated; very strongly acid; gradual wavy boundary.
- C4—56 to 76 inches; very pale brown (10YR 7/3) fine sand; common fine and medium distinct strong brown (7.5YR 5/6) mottles; weak medium granular structure; loose; few coarse roots; many uncoated sand grains; strongly acid; gradual wavy boundary.
- C5—76 to 86 inches; white (10YR 8/1) fine sand; few fine faint yellowish brown and very pale brown mottles; single grained; loose; few coarse roots; strongly acid.

These soils are fine sand to a depth of 80 inches or more. Reaction ranges from very strongly acid to medium acid in all horizons. The content of silt and clay in the 10- to 40-inch control section is less than 5 percent.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 1 or 2 or value of 5 and chroma of 1; or hue of 2.5Y, value of 3 or 4, and chroma of 2. It is 3 to 8 inches thick.

The C horizon in the upper part has hue of 10YR, value of 6 or 7, and chroma of 3 or 4 or value of 5 and chroma of 2 to 8. In the lower part it has hue of 10YR, value of 6, and chroma of 1 to 3 or value of 7 and chroma of 1 to 4 or value of 8 and chroma of 1 or 2. In the lower part there are brown, yellow, or red mottles. In some pedons, large splotches or mottles that have chroma of 2 or 1 are within a depth of 40 inches. The colors are those of the sand grains and are not indicative of wetness.

The lower part of the C horizon, in pedons on benches along the larger streams and rivers, is at a depth of more than 40 inches; it is extremely hard (iron-cemented) sand or fine sand. It has hue of 10YR, value of 5 to 7, and chroma of 3 to 8.

Tomoka series

The Tomoka series consists of very poorly drained soils that formed in well decomposed organic material and in the underlying sandy and loamy mineral material. Permeability is moderate to moderately rapid. The soils are nearly level. They are in freshwater marshes. Slopes are less than 2 percent. In undrained areas the water table is at or above the surface except during extended dry periods. These soils are loamy, siliceous, dysic, hyperthermic Terric Medisaprists.

Tomoka soils are near Bradenton, Delray, Felda, and Floridana soils. All the associated soils are mineral soils

and except for the Delray and Floridana soils are better drained than the Tomoka soils.

Typical pedon of Tomoka muck, about 5 miles southwest of Myakka City and 0.25 mile south of Cason Lake, NW1/4NW1/4 sec. 29, T. 36 S., R. 21 E.

- Oa1—0 to 12 inches; black (5YR 2/1) muck; moderate medium granular structure; friable; extremely acid; gradual wavy boundary.
- Oa2—12 to 18 inches; dark reddish brown (5YR 3/2) muck; moderate medium granular structure; friable; extremely acid; gradual wavy boundary.
- Oa3—18 to 25 inches; black (5YR 2/1) muck; moderate medium granular structure; friable; extremely acid; gradual wavy boundary.
- Oa4—25 to 28 inches; black (5YR 2/1) muck; common coarse distinct gray (10YR 5/1) sand lenses; moderate medium granular structure; friable; extremely acid; clear wavy boundary.
- IIC1—28 to 32 inches; dark gray (10YR 4/1) and light brownish gray (10YR 6/2) sand; single grained; loose; strongly acid; clear wavy boundary.
- IIC2—32 to 35 inches; black (10YR 2/1) sand and loamy sand; single grained; loose; medium acid; abrupt wavy boundary.
- IIIC3—35 to 40 inches; gray (10YR 5/1) sandy clay loam; many fine and medium distinct very dark gray (10YR 3/1) and light gray (10YR 6/1) mottles and streaks of sand; massive; friable; slightly acid; gradual wavy boundary.
- IIIC4—40 to 50 inches; gray (10YR 5/1) sandy clay loam; massive; friable; slightly acid; gradual wavy boundary.
- IIIC5—50 to 75 inches; gray (10YR 5/1) sandy clay loam with common light gray (10YR 6/1) sand pockets and lenses; massive; friable; neutral.

Reaction of the Oa horizon is less than 4.5 in 0.01*M* CaCl2 and from 5.5 to 6.5 in field test. The IIC and IIIC horizons range from very strongly acid to neutral.

The Oa horizon has hue of 10YR or 5YR, value of 2, and chroma of 1 or 2; hue of 5YR, value of 3, and chroma of 2 or 3; or no hue (N) and value of 2. It ranges from 16 to 40 inches in thickness.

The IIC horizon has hue of 10YR or 2.5Y, value of 2 to 6, and chroma of 2 or 1. It ranges from sand to loamy fine sand. The IIIC horizon has hue of 10YR or 2.5Y, value of 2 to 7, and chroma of 2 or 1. It is sandy loam, fine sandy loam, or sandy clay loam. In many pedons there are lenses and pockets of finer or coarser textured material in the lower IIIC horizons.

Wabasso series

The Wabasso series consists of poorly drained, slowly permeable to very slowly permeable soils that formed in sandy and loamy marine sediment. The soils are nearly level. They are in areas of low, broad flatwoods on flood plains. In most years, if the soils are not drained, the water table is at a depth of 10 to 40 inches for more

than 6 months of the year. It is at a depth of less than 10 inches for less than 60 days in wet seasons and is at a depth of more than 40 inches in very dry seasons. In some areas on flood plains, the soils are flooded frequently, and in other areas they are flooded only rarely. Slopes range from 0 to 2 percent. These soils are sandy, siliceous, hyperthermic Alfic Haplaquods.

Wabasso soils are near Bradenton, limestone substratum, Delray, EauGallie, Felda, Floridana, and Palmetto soils. Bradenton, limestone substratum, soils do not have a sandy surface layer that is more than 20 inches thick or a spodic horizon. Delray and Floridana soils have a mollic epipedon, do not have a spodic horizon, and are in depressions. EauGallie soils have an argillic horizon at a depth between 40 and 80 inches. Felda soils do not have a spodic horizon. EauGallie and Felda soils are in the same positions on the landscape as Wabasso soils. Palmetto soils do not have a spodic horizon and are in poorly defined drainageways and sloughs.

Typical pedon of Wabasso fine sand, in an improved pasture, 1 mile north of Florida Highway 64, 1 mile southwest of Manatee River, NW1/4NW1/4 sec. 25, T. 34 S., R. 18 E.

- Ap—0 to 7 inches; very dark gray (10YR 3/1) fine sand; mixture of organic matter and light gray sand grains has a salt and pepper appearance; weak fine granular structure; very friable; many fine and medium roots; strongly acid; clear wavy boundary.
- A21—7 to 12 inches; gray (10YR 5/1) fine sand; single grained; loose; common fine and medium roots; common uncoated sand grains; strongly acid; clear smooth boundary.
- A22—12 to 21 inches; light gray (10YR 7/1) fine sand; single grained; loose; medium vertical dark gray and very dark gray streaks in the matrix and along root channels; few medium roots; very strongly acid; abrupt wavy boundary.
- B21h—21 to 25 inches; black (5YR 2/1) fine sand; massive parting to moderate fine granular; sand grains are well coated with organic matter; few fine roots; very strongly acid; clear wavy boundary.
- B22h—25 to 28 inches; dark reddish brown (5YR 2/2) fine sand; massive parting to weak fine granular; firm; few fine and medium roots; many sand grains coated with organic matter; very strongly acid; clear wavy boundary.
- B3—28 to 31 inches; brown (10YR 4/3) fine sand; few medium faint very dark brown streaks and mottles; single grained; loose; many sand grains are thinly coated with organic matter; very strongly acid; gradual wavy boundary.
- A'2—31 to 37 inches; pale brown (10YR 6/3) fine sand; few fine faint streaks of very dark grayish brown; single grained; loose; medium acid; gradual wavy boundary.

- B'21t—37 to 46 inches; grayish brown (10YR 5/2) sandy loam; few medium prominent red (2.5YR 4/8) and distinct brownish yellow (10YR 6/8) mottles; weak fine granular structure; friable; sand grains are bridged and coated with clay; few fine light gray (10YR 7/1) sand lenses; slightly acid; gradual wavy boundary.
- B'22t—46 to 65 inches; gray (10YR 6/1) sandy clay loam; few coarse distinct reddish yellow (7.5YR 6/6), strong brown (7.5YR 5/8), and dark brown (7.5YR 4/4) mottles; weak fine subangular blocky structure; firm; sand grains are distinctly coated and bridged with clay; few thin patchy clay films on ped faces and in root channels; slightly acid; gradual wavy boundary.
- Cg—65 to 80 inches; gray (10YR 6/1) sand mixed with many fine shell fragments; brownish yellow and strong brown mottles; single grained; mildly alkaline.

Reaction ranges from neutral to very strongly acid in the A, B2h, and B3 horizons and from medium acid to raildly alkaline in the horizons below.

The Ap, or A1, horizon has no hue (N) or has hue of 10YR; value is 2 or 3, and chroma is 1 or 2. It generally has a salt and pepper appearance where undisturbed. It ranges from 3 to 8 inches in thickness. The A2 horizon has hue of 10YR, value of 5 to 7, and chroma of 1 or 2. Total thickness of the A horizon is 16 to 30 inches.

The B2h horizon has hue of 5YR to 10YR, value of 2 or 3, and chroma of 3 or less. It is 7 to 18 inches thick.

The B3 horizon has hue of 5YR to 10YR, value of 4, and chroma of 2 to 4. It is fine sand or sand and ranges to 6 inches in thickness. The B3&Bh horizon, where present, has matrix colors similar to those of the B3 horizon and also has black or dark reddish brown weakly cemented Bh fragments.

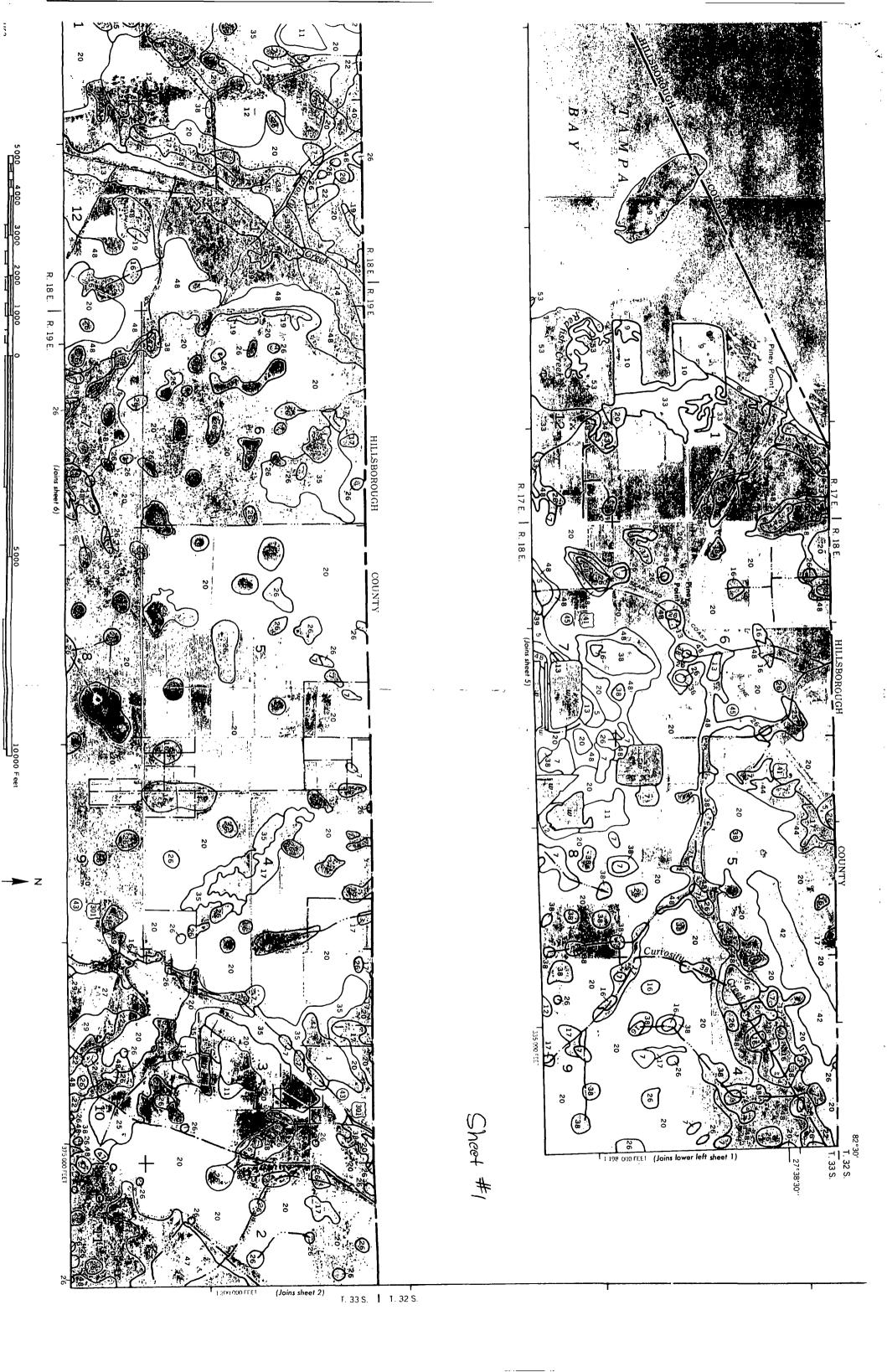
The A'2 horizon has no hue (N) or has hue of 10YR or 2.5Y; value is 5 to 8, and chroma is 3 or less. It is fine sand or sand and ranges to 14 inches in thickness.

The B'2t horizon has hue of 10YR, 2.5Y, and 5Y, value of 4 to 7, and chroma of 1 to 8. It has gray, brown, yellow, and red mottles. It is fine sandy loam, sandy loam, or sandy clay loam. In some pedons there are few to common, fine and medium nodules of white (10YR 8/1) carbonatic material. The B'2t horizon is at a depth between 26 and 40 inches. It is 15 to 30 inches thick.

The Cg horizon has no hue (N) or has hue of 10YR; value is 5 to 7, and chroma is 1 or 0. It is a mixture of sand or loamy sand and shell fragments.

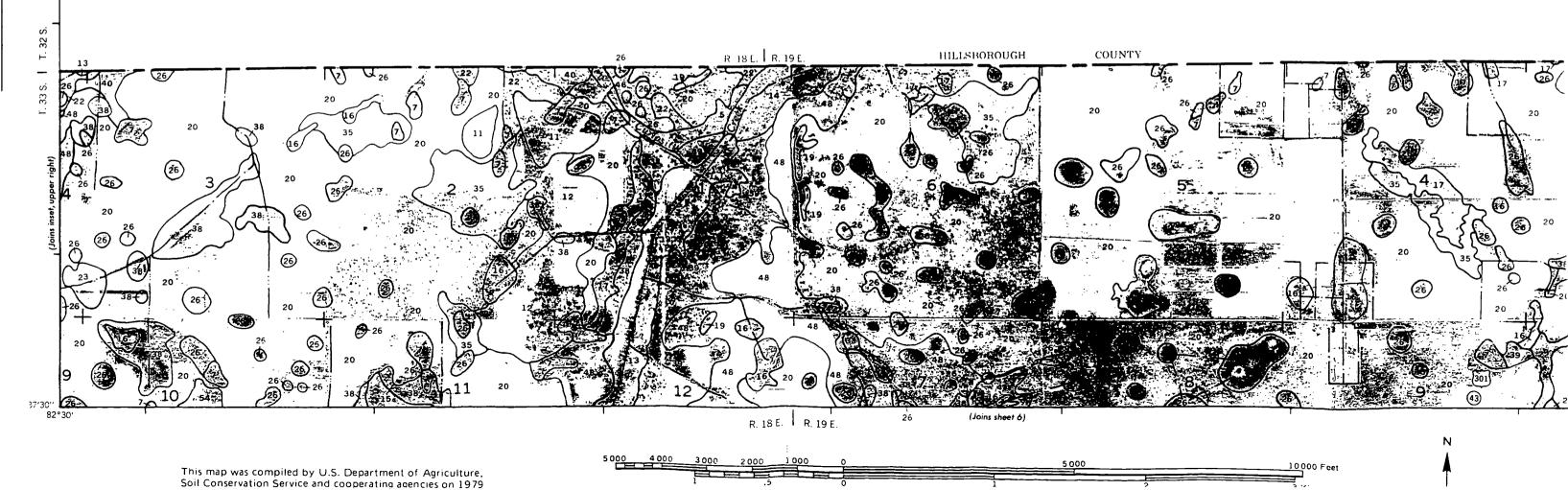
Wabasso Variant

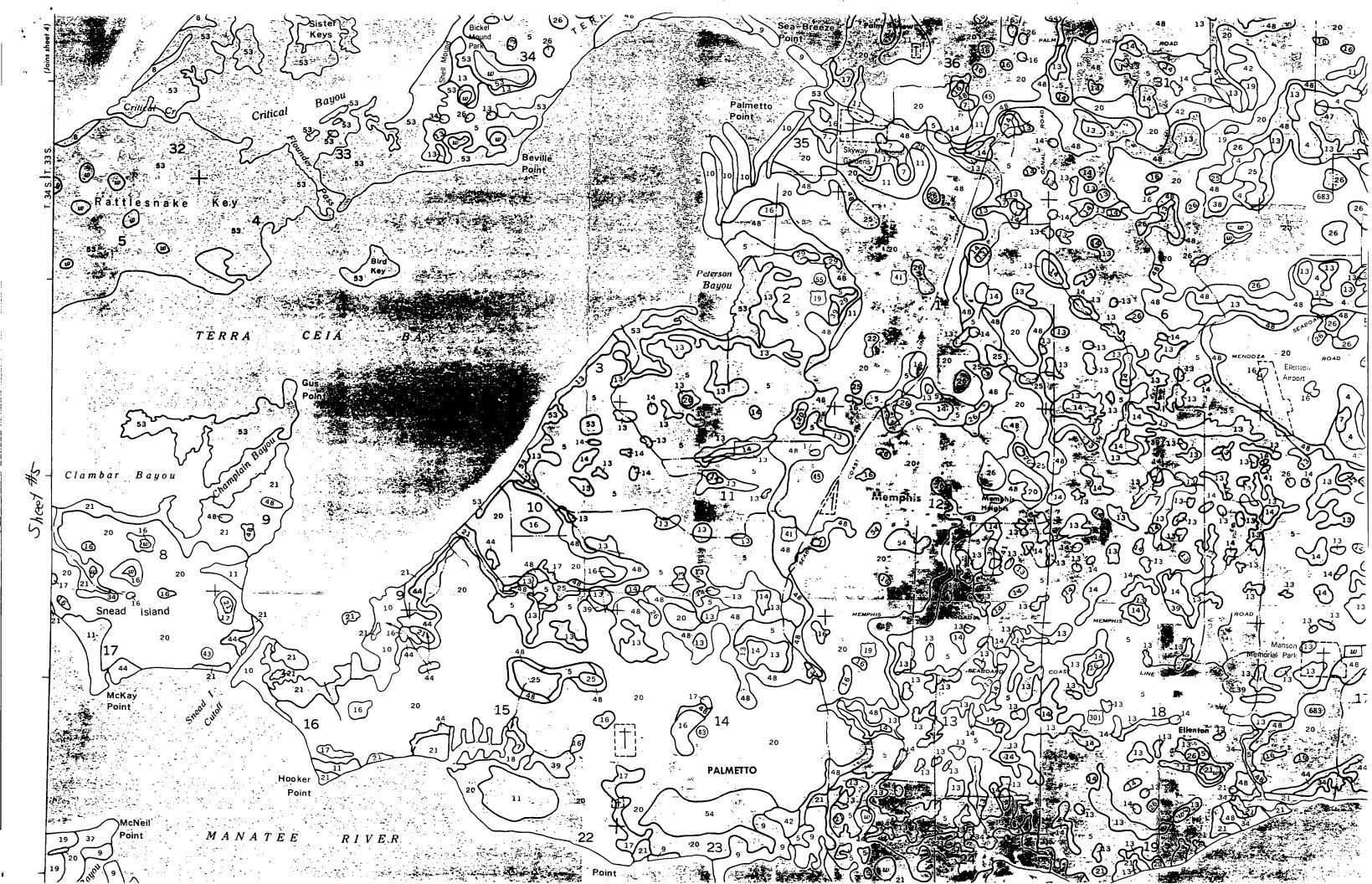
Wabasso Variant soils are poorly drained. They formed in sandy and loamy marine sediment overlying limestone. Permeability is slow to moderately slow. The soils are nearly level. They are in areas of low, broad flatwoods. Slopes are 0 to 2 percent. In most years, if the soils are

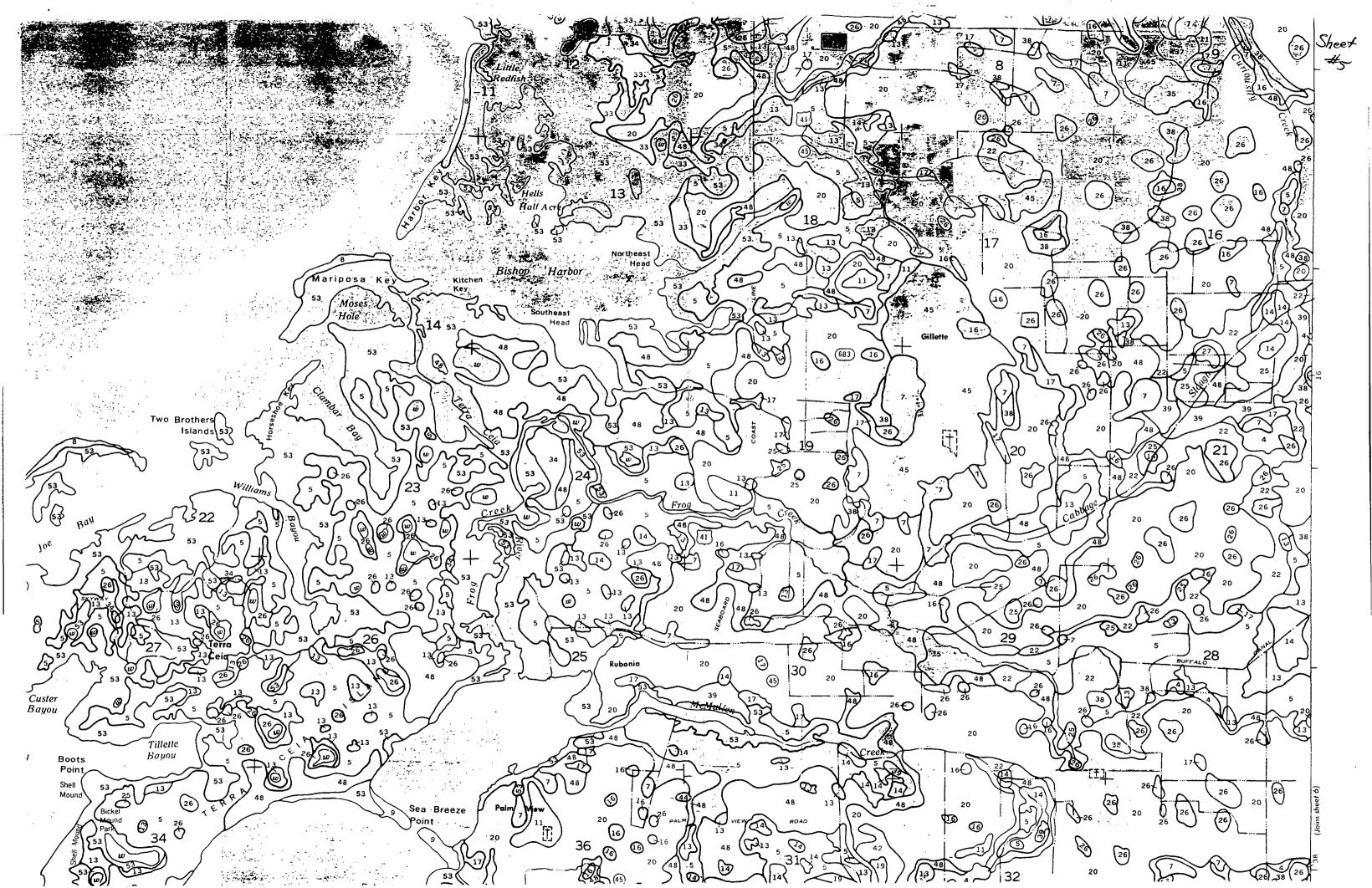


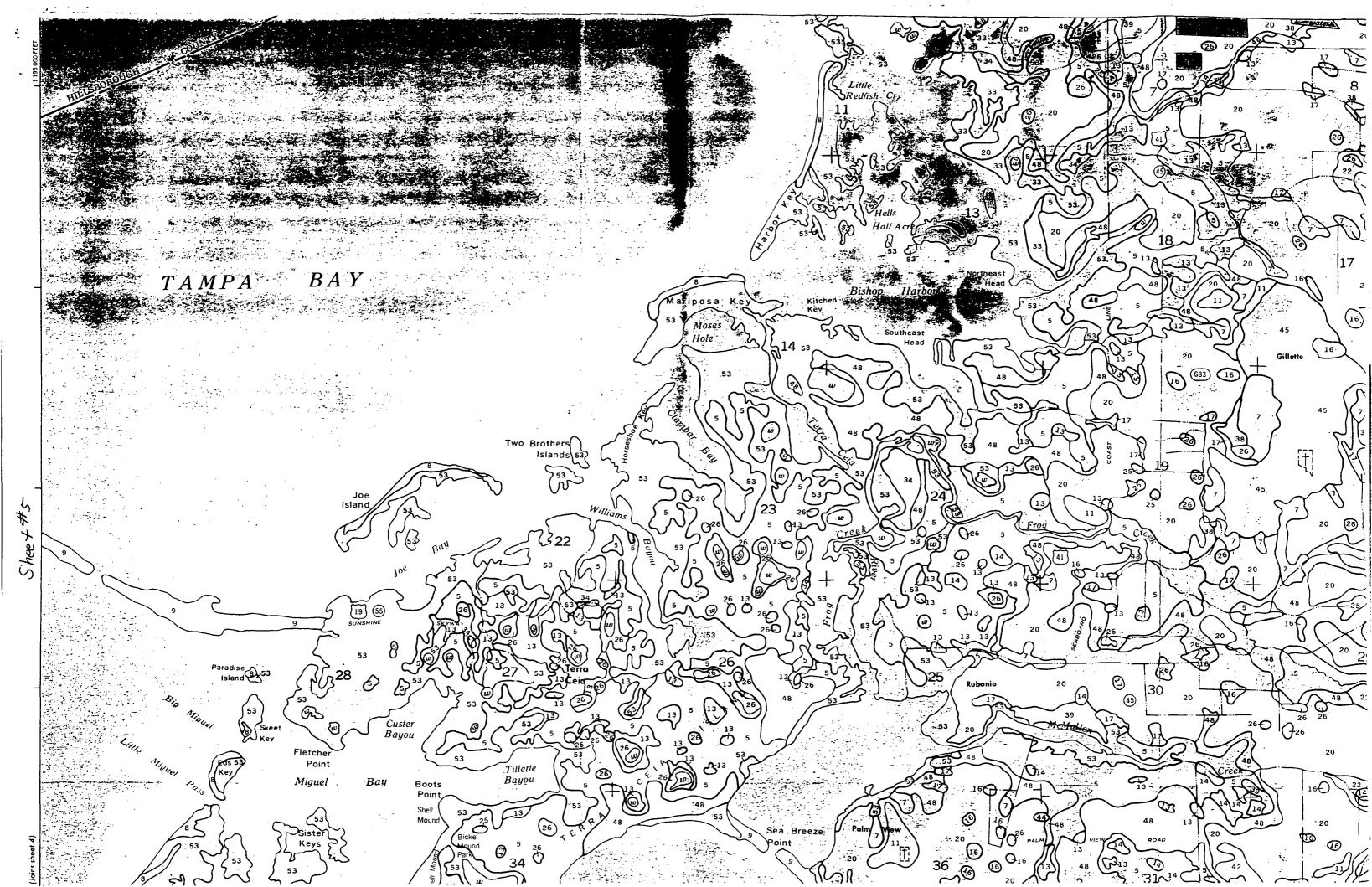


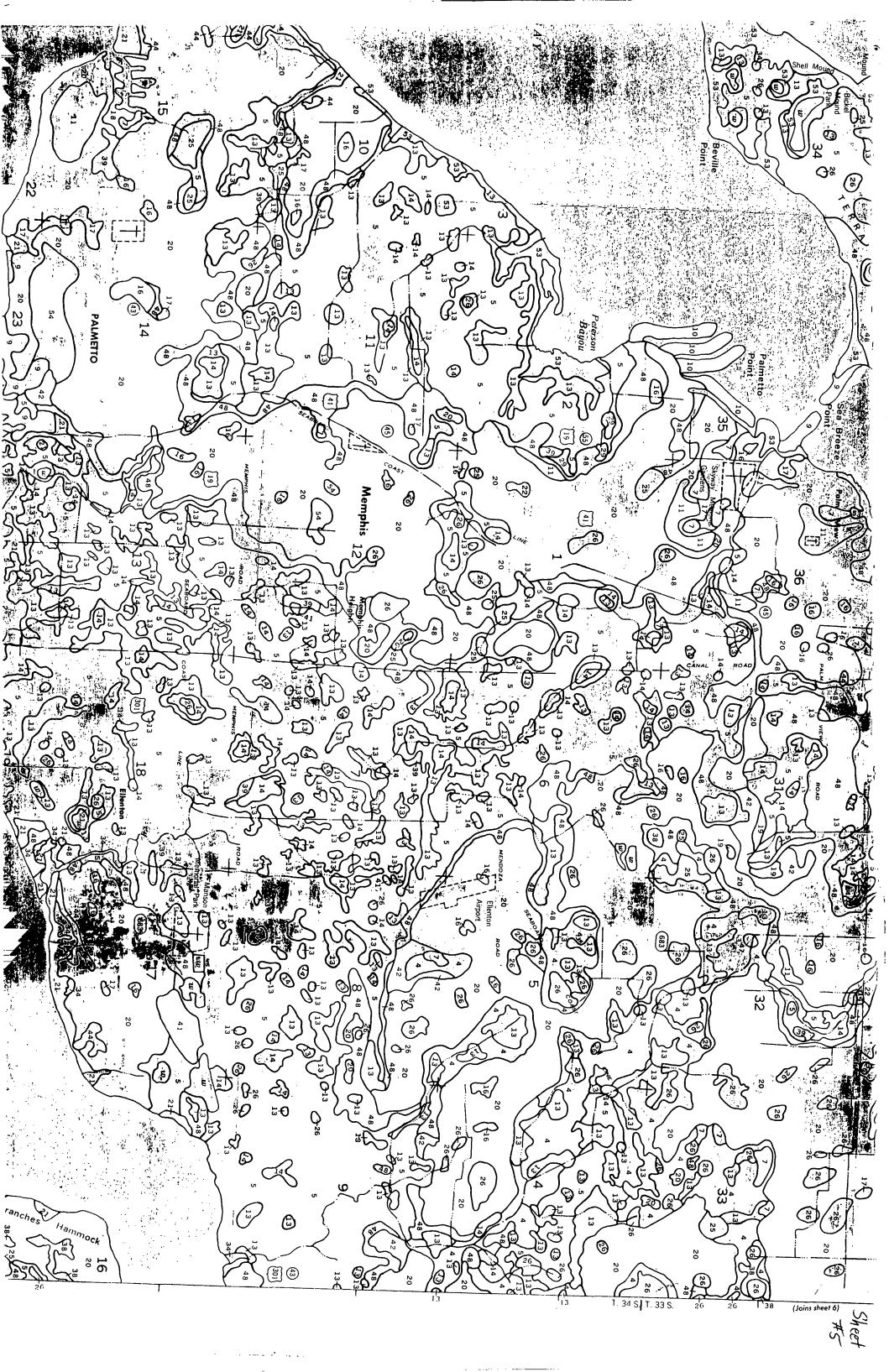
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STATE OF FLORIDA DEPARTMENT OF NATURAL RESOURCES

Tom Gardner, Executive Director

DIVISION OF RESOURCE MANAGEMENT Jeremy A. Craft, *Director*

FLORIDA GEOLOGICAL SURVEY Walter Schmidt, State Geologist

BULLETIN NO. 59

THE LITHOSTRATIGRAPHY OF THE HAWTHORN GROUP (MIOCENE)
OF FLORIDA

By Thomas M. Scott

Published for the
FLORIDA GEOLOGICAL SURVEY
TALLAHASSEE
1988

DEPARTMENT OF NATURAL RESOURCES



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LETTER OF TRANSMITTAL

Bureau of Geology August 1988

Governor Bob Martinez, Chairman Florida Department of Natural Resources Tallahassee, Florida 32301

Dear Governor Martinez:

The Florida Geological Survey, Bureau of Geology, Division of Resource Management, Department of Natural Resources, is publishing as its Bulletin No. 59, *The Lithostratigraphy of the Hawthorn Group (Miocene) of Florida.* This is the culmination of a study of the Hawthorn sediments which exist throughout much of Florida. The Hawthorn Group is of great importance to the state since it constitutes the confining unit over the Floridan aquifer system. It is also of economic importance to the state due to its inclusion of major phosphorite deposits. This publication will be an important reference for future geological investigations in Florida.

Respectfully yours,

Walter Schmidt, Chief Florida Geological Survey

Printed for the Florida Geological Survey

Tallahassee 1988

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SOUTH FLORIDA

Although the Hawthorn Group in south Florida consists of the same general sediment types (carbonate, quartz sand, clay and phosphate), the variability and complexity of the section is different from the strata in northern Florida. In the south Florida area (Figure 1), particularly the western half of the area, the Hawthorn Group consists of a lower, predominantly carbonate unit and an upper, predominantly siliciclastic unit. Eastward the section becomes more complex due to a greater percentage of siliciclastic beds present in the lower portion of the Hawthorn Group.

The differences that exist between the northern and southern sections of the Hawthorn Group require separate formational nomenclature. In southern Florida, the Hawthorn Group consists of in ascending order, the Arcadia Formation (new name) with the Tampa and Nocatee (new name) Members and the Peace River Formation (new name) with the Bone Valley Member (Figure 33). The new nomenclature helps alleviate many of the previously existing problems associated with the relationship of the Bone Valley, Tamiami, Hawthorn, and Tampa units in the south Florida region.

ARCADIA FORMATION Definition and Type Section

The Arcadia Formation is a new formational name proposed here for the lower Hawthorn carbonate section in south Florida. This unit includes sediments formerly assigned to the Tampa Formation or Limestone (King and Wright, 1979) and the "Tampa sand and clay" unit of Wilson (1977).

Dall and Harris (1892) used the term "Arcadia marl" to describe beds along the Peace River. This term was never widely used and did not appear in the literature again except in reference to Dall and Harris. It appears that their use of the "Arcadia marl" described a carbonate bed now belonging in the Peace River Formation of the upper Hawthorn Group. Riggs (1967) used the term "Arcadia formation" for the carbonate beds often exposed at the bottom of the phosphate pits in the Central Florida Phosphate District. Riggs' use of this name was never formalized. The "Lexicon of Geologic Names" (U.S.G.S., 1966) listed the name Arcadia as being used as a member of the Cambrian Trempealeau Formation in Wisconsin and Minnesota, thereby precluding its use elsewhere. Investigations into the current status of this name indicated that the Arcadia member has not been used in some 25 years and does not fit the current Cambrian stratigraphic framework. The Lexicon also indicates Arcadia clays as an Eocene (Claibornian) unit in Louisiana. This name also has been dropped from the stratigraphic nomenclature of Louisiana Geological Survey, 1984, personal communication). Since these former usages of this name are no longer viable, the term can be used for the lower Hawthorn Group sediments in southern Florida in accordance with Article 20 of the North American Code of Stratigraphic Nomenclature (NACSN, 1983).

The Arcadia Formation is named after the town of Arcadia in DeSoto County, Florida. The type section is located in core W-12050, Hogan #1, DeSoto County (SE¼, NW¼, Section 16, Township 38S, Range 26E, surface elevation 62 feet (19 meters)) drilled in 1973 by the Florida Geological Survey. The type Arcadia Formation occurs between -97 feet MSL (-30 meters MSL) to -520 feet MSL (-159 meters) (Figure 34).

Two members can be recognized within the Arcadia Formation in portions of south Florida. These are the Tampa Member and the Nocatee Member (Figure 33). The members are not recognized throughout the entire area. When the Tampa and Nocatee are not recognized, the section is simply referred to as the Arcadia Formation.

Lithology

The Arcadia Formation, with the exception of the Nocatee Member, consists predominantly of limestone and dolostone containing varying amounts of quartz sand, clay and phosphate grains. Thin beds of quartz sand and clay often are present scattered throughout the section. These thin sands and clays are generally very calcareous or dolomitic and phosphatic. Figure 34 graphically illustrates the lithologies of the Arcadia Formation including the Tampa and Nocatee Members. The lithologies of the

Tampa and Nocatee Members will be discussed separately from the undifferentiated Arcadia Formation. Dolomite is generally the most abundant carbonate component of the Arcadia Formation except in the Tampa Member. Limestone is common and occasionally is the dominant carbonate type. The dolostones are quartz sandy, phosphatic, often slightly clayey to clayey, soft to hard, moderately to highly altered, slightly porous to very porous (moldic porosity) and micro- to fine crystalline. The dolostones range in color from yellowish gray (5 Y 8/1) to light olive gray (5 Y 6/1). The phosphate grain content is highly variable ranging up to 25 percent but is more commonly in the 10 percent range. The limestones of the Arcadia are typically quartz sandy, phosphatic, slightly clayey to clayey, soft to hard, low to highly recrystallized, variably porous and very fine to fine grained. The limestones are typically a wackestone to mudstone with few beds of packstone. They range in color from white (N 9) to yellowish gray (5 Y 8/1). The phosphate grain content is similar to that described for the dolostones. Fossils are generally present only as molds in the carbonate rocks.

Clay beds occur sporadically throughout the Arcadia Formation. They are thin, generally less than 5 feet thick, and of limited areal extent. The clays are quartz sandy, silty, phosphatic, dolomitic and poorly to moderately indurated. Color of the clay ranges from yellowish gray (5 Y 8/1) to light olive gray (5 Y 6/1). Lithoclasts of clay are often found in other lithologies. Smectite, illite, palygorskite, and sepiolite comprise the clay mineral suite (Reynolds, 1962).

Quartz sand beds also occur sporadically and are generally less than 5 feet thick. They are very fine to medium grained (characteristically fine grained), poorly to moderately indurated, clayey, dolomitic and phosphatic. The sands are usually yellowish gray (5 Y 8/1) in color.

Chert is also sporadically presently in the Arcadia Formation in the updip areas (portions of Polk, Hillsborough, Manatee and Hardee Counties). In many instances the chert appears to be silicified clays and dolosilts.

Subjacent and Suprajacent Units

The Arcadia Formation overlies either the Ocala Group or the "Suwannee" Limestone in the south Florida region (Figure 8). The contact between the basal Arcadia and the Ocala Group is an easily recognized unconformity. In the north central and northeastern portions of southern Florida, where the Hawthorn Group overlies the Ocala Group (Figures 8 and 41), the Arcadia is characteristically a gray, hard, quartz sandy, phosphatic dolostone with a few siliciclastic interbeds. This is in contrast to the Ocala Group, which is a cream to white, fossiliferous, soft to hard limestone (packstone to wackestone).

Throughout most of south Florida, the Hawthorn Group overlies limestones most often referred to as the "Suwannee" Limestone (Figure 33). In much of this area the contact is recognizably unconformable. The contrast between the sandy, phosphatic, fine-grained to finely crystalline carbonates of the Arcadia and the coarser grained nonphosphatic, non-quartz-sandy limestones of the "Suwannee" Limestone allow the contact to be easily placed. However, in the downdip areas (e.g., Lee and Charlotte Counties and further south) the contact becomes more obscure. In this area the contact is placed at the base of the last occurrence of a sandy, variably phosphatic carbonate.

The limestones underlying the Arcadia are referred to as "Suwannee" limestone due to the uncertainty of the formational assignment. These sediments have characteristically been called "Suwannee" by previous workers despite the fact that they have never been accurately correlated with the typical Suwannee Limestone in northern Florida. Hunter (personal communication, 1984) believes that these carbonates are not Suwannee or the equivalent but are an unnamed limestone of Chickasawhayan Age (Late Oligocene).

Unconformably overlying the Arcadia Formation is the Peace River Formation (Figure 33). The Peace River Formation is predominantly a siliciclastic unit with varying amounts of carbonate beds. The percentage of carbonate beds is higher near the base of the Peace River, resulting in a transitional or gradational contact with the Arcadia. In some areas the contact is often marked by a phosphatic rubble zone and/or a phosphatized dolostone hardground. In the more gradational sequence the contact is placed where the carbonate beds become significantly more abundant than the siliciclastic beds.

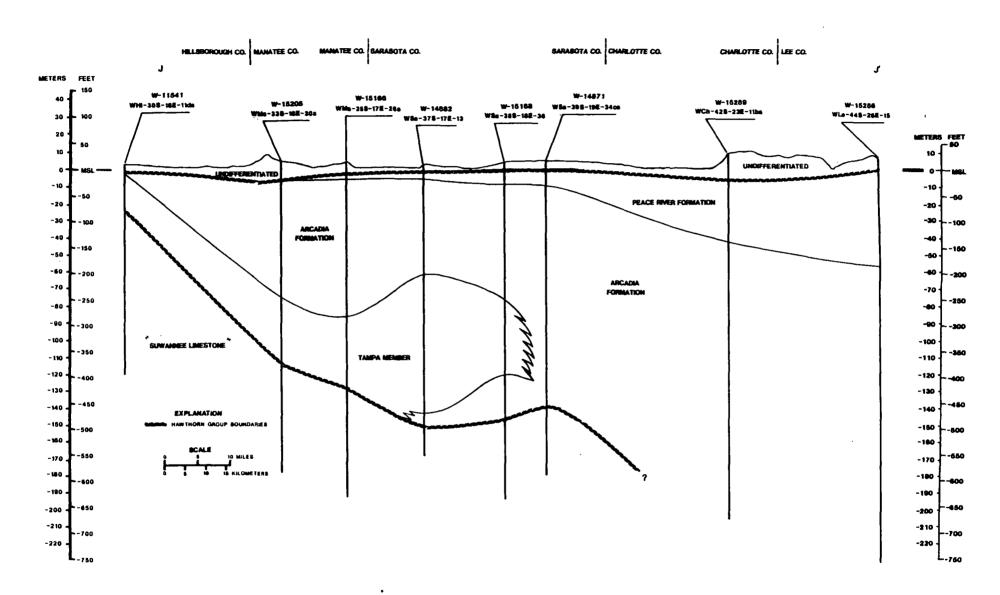


Figure 38. Cross section J-J' (see figure 3 for location).

Lithology

The Tampa Member consists predominantly of limestone with subordinate dolostone, sands, and clays. The lithology of the Tampa is very similiar to the limestone portion of the Arcadia Formation with the exception of its phosphate content which is almost always noticeably less than in the Arcadia. Phosphate grains generally are present in the Tampa in amounts less than 3 percent although beds containing greater percentages do occur, particularly near the facies change limits of the member.

Lithologically, the limestones are variably quartz sandy and clayey with minor to no phosphate. Fossil molds are often present and include mollusks, foraminifera and algae. Colors range from white (N 9) to yellowish gray (5 Y 8/1). The limestones range from mudstones to packstones but are most often wackestones. The dolostones are variably quartz sandy and clayey with minor to no phosphate. They are typically microcrystalline to very fine grained and range in color from pinkish gray (5 Y 8/1) to light olive gray (5 Y 6/1). The dolostones often contain fossil molds similar to those in the limestones.

Sand and clay beds occur sporadically within the Tampa Member. Lithologically, they are identical to those described for the Arcadia Formation except for the phosphate content which is significantly lower in the Tampa Member.

Siliceous beds are often present in the more updip portions of the Tampa. In the type area near Tampa Bay the unit is well known for silicified corals, siliceous pseudomorphs of many different fossils and chert boulders.

Subjacent and Suprajacent Units

The Tampa Member overlies the "Suwannee" Limestone in areas where the Nocatee Member is not present and the Tampa Member forms the base of the Arcadia. The boundary often appears gradational as discussed by King (1979) and King and Wright (1979). Figure 19 indicates an unconformable time relationship with the "Suwannee" Limestone which often is not apparent lithologically. This indicates a probable reworking of underlying materials into the Tampa Member obscuring the unconformity.

The Tampa Member overlies the Nocatee Member in the area where both are present (Figure 33). The contact appears conformable and is easily recognized. In a few areas where the Nocatee is absent, the Tampa may overlie undifferentiated Arcadia Formation sediments. The Tampa Member may be both overlain and underlain by undifferentiated Arcadia.

The Tampa Member is overlain throughout most of its extent by carbonates of the undifferentiated Arcadia Formation. The contact often appears gradational over one or two feet. An increase in phosphate grain content is the dominant factor in defining the lithologic break. In updip areas the Tampa may be overlain by siliciclastic sediments of the Peace River Formation. Further updip it may be exposed at the surface or covered by a thin veneer of unconsolidated sands and clays which may represent residuum of the Hawthorn sediments. Figure 35 through 39 show the relationship of the Tampa Member to the overlying and underlying units.

Thickness and Areal Extent

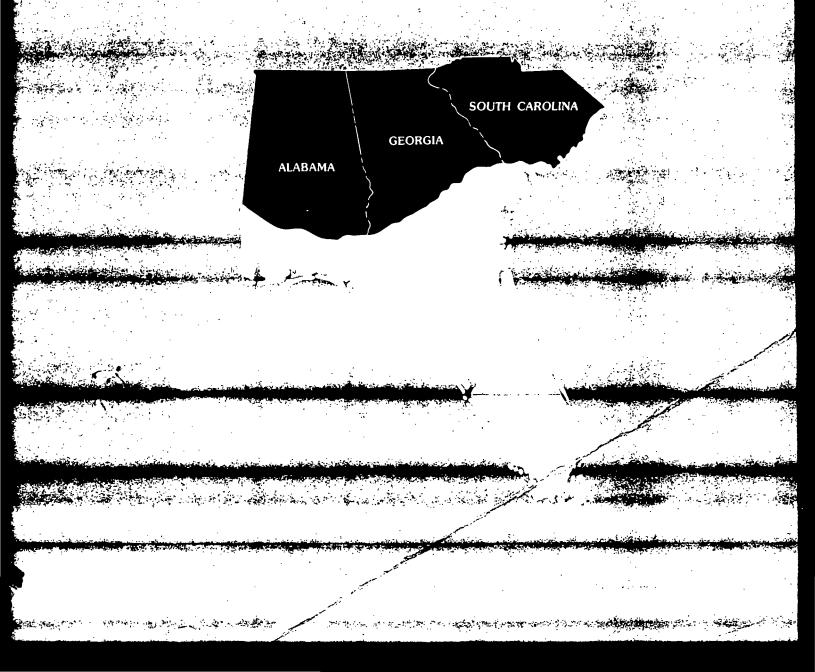
The Tampa Member is quite variable in thickness throughout its extent. It thins updip to its northern limit where it is absent due to erosion and possibly nondeposition. The thickest section of Tampa encountered is in W-14882 in Sarasota County where 270 feet (82 meters) of section are assigned to this member (Figure 45). More typically an average thickness is approximately 100 feet (30.5 meters).

The top of the Tampa Member (Figure 46) ranges in elevation from as high as +75 feet (23 meters) MSL in northeastern Hillsborough County to -323 feet (-98.5 meters) MSL in northern Sarasota County. The lowest elevation for the top of the unit occurs in a rather large depression that encompasses part of northern Sarasota County and southern Manatee County.

The Tampa dips towards the south in the northern half of the area of occurrence (Figure 46). Dip direction in the southern half is more to the southwest and west. Dip angle varies from place to place but the

HYDROGEOLOGIC THE FLORIDAN AQUIFER SYSTEM IN FLORIDA AND IN PARTS OF GEORGIA, ALABAMA, AND SOUTH CAROLINA

REGIONAL AQUIFER-SYSTEM ANALYSIS

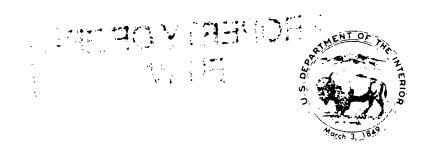


Hydrogeologic Framework of the Floridan Aquifer System in Florida and in Parts of Georgia, Alabama, and South Carolina

By JAMES A. MILLER

REGIONAL AQUIFER-SYSTEM ANALYSIS

U.S. GEOLOGICAL SURVEY PROFESSIONAL PAPER 1403-B



grade updip by facies change into calcareous, glauconitic, clastic rocks. This carbonate-clastic transition lies farther to the north and west in lower Eocene strata than it does in the underlying Paleocene and is located still farther north and west in middle Eocene rocks. Upper Eocene rocks retain their carbonate character in many places up to the point where they are truncated by erosion. The overall effect is that of a general regional transgression that began in Paleocene time and persisted through the late Eocene and during which the marine facies of progressively younger rocks extended progressively farther and farther inland. Several minor regressions punctuated this general transgression. These observations are consistent with the sea level curve of Vail and others (1977), which shows that sea level worldwide became progressively higher from early to late Eocene time.

ROCKS OF EARLY EOCENE AGE

Downdip, a lower Eocene carbonate sequence underlies southeastern Georgia and the Florida peninsula; updip, the remainder of the study area is underlain by clastic lower Eocene rocks. Locally, in South Carolina, the Eocene in the subsurface is an impure limestone. Plate 4 shows the configuration of the top of rocks of early Eocene age and the area where they crop out. Comparison of plate 4 with a map of the structural surface of the Paleocene (pl. 3) shows that, in Alabama and southwestern Georgia, lower Eocene rocks lie to the south and east of Paleocene rocks in offlap relationship. In central Georgia, however, beds of early Eocene age overlap and extend farther to the north than the underlying Paleocene rocks. Lower Eocene rocks are known to extend farther to the north in this overlap area than plate 4 shows, but they have been mapped during this study only to the limits of the well control used to delineate the Floridan aquifer system. In the western part of the study area, the configuration of the top of the early Eocene is contoured up to the limit of outcrop of these rocks (pl. 4).

Many of the large- to intermediate-scale structural features that affect the shape of the Paleocene surface (pl. 3) are recognizable on the early Eocene surface (pl. 4). Those features common to both maps include (1) the Peninsular arch in north-central Florida, (2) the Southeast Georgia embayment, and (3) a steep, steady slope toward the Gulf Coast geosyncline in the western part of the study area. The Southwest Georgia embayment in eastern panhandle Florida is a negative area on both the Paleocene and early Eocene tops, but this feature is deeper and narrower and extends farther to the northeast on the early Eocene surface than it does

on the top of the Paleocene. The configuration of the South Florida basin in southwestern peninsular Florida likewise differs on the Paleocene and early Eocene surfaces. This feature was somewhat silled on its gulfward side in Paleocene time (pl. 3) but, at the end of early Eocene time (pl. 4) it was open to the gulf and appears to have been partially filled from the east and northeast. The Suwannee strait, a closed low that appears in southeastern Georgia on the map of the Paleocene surface, was apparently filled with sediments during early Eocene time and thus does not exist on the map of the early Eocene surface.

The maximum measured depth to the top of lower Eocene rocks is about 3,900 ft below sea level in well ALA-BAL-30 in the southern part of Baldwin County. Ala. The maximum contoured depth is below 4,200 ft, in the same general area. Lower Eocene rocks are slightly less than 800 ft below sea level on the crest of the Peninsular arch, from which they deepen in all directions. In the Southwest Georgia embayment and the South Florida basin, the top of lower Eocene rocks is below 2,600 ft.

The thickness of lower Eocene strata is shown on plate 5, along with the distribution of the clastic and carbonate facies within this unit. The clastic-carbonate boundary and much of the contouring shown on this plate are derived from well control. In areas of sparse control, the thickness of the early Eocene has been estimated as the difference between contoured altitudes of the top of the early Eocene (plate 4) and the top of the Paleocene (plate 3). In south Florida, lower Eocene rocks are more than 1.500 ft thick; in parts of panhandle Florida, they are more than 1.100 ft thick. On the crest of the Peninsular arch, these strata are less than 300 ft thick, and they thin to a featheredge in areas of outcrop.

OLDSMAR FORMATION—Except for the Fishburne Formation that occurs locally in South Carolina, all the lower Eocene carbonate rocks in the study area are part of the unit that Applin and Applin (1944) named the Oldsmar Limestone. The Oldsmar, however, contains much dolomite, and thin beds of chert and evaporite deposits occur in the unit from place to place. The Oldsmar is therefore referred to as a "formation" rather than a "limestone."

The Oldsmar Formation consists mostly of off-white to light-gray micritic to finely pelletal limestone thickly to thinly interbedded with gray to tan to light-brown, fine to medium crystalline, commonly vuggy dolomite. The lower part of the formation is usually more extensively dolomitized than the upper part. Pore-filling gypsum and thin beds of anhydrite occur in the lowermost parts of the Oldsmar in places, particularly in a crescent-shaped band extending from Dixie County, Fla., northeast to southern Ware County, Ga

The location of this band, which locally comprises the base of the Floridan aquifer system, is shown on plate 33. In scattered places, the Oldsmar contains trace amounts of glauconite.

Applin and Applin (1944, p. 1699) defined the Oldsmar "to include the interval that is marked at the top by the presence of abundant specimens of Helicostegina gyralis Barker and Grimsdale...and that rests on the Cedar Keys limestone." This definition is unsatisfactory because (1) it is based on the microfaunal content of the strata, not on their lithologic characteristics, and (2) it is based on a species whose range is not restricted to the early Eocene. The author has found specimens of H. gyralis that show no evidence of reworking 50 to 70 ft above the top of the Oldsmar in rocks that are part of the overlying middle Eocene sequence ("Lake City" Limestone). Cole and Gravell (1952) reported this species from middle Eocene beds in Cuba. The Oldsmar Formation is thus redefined herein as the sequence of white to gray limestone and interbedded tan to light-brown dolomite that lies between the pelletal, predominantly brown limestone and brown dolomite of the middle Eocene and the grav. coarsely crystalline dolomite of the Cedar Keys Formation. H. gyralis is commonly found as part of a characteristic Oldsmar fauna that includes several other species of larger foraminifers listed in table 1. None of these species, however, is ubiquitous within the Oldsmar Formation, nor should they be the criterion by which the Oldsmar is defined.

The Oldsmar Formation underlies all of the Florida peninsula and the southeastern corner of Georgia (pl. 5). Westward, in the eastern part of the Florida panhandle, the Oldsmar becomes increasingly argillaceous and interfingers with calcareous clastic rocks. To the north, in south-central Georgia, the Oldsmar grades from limestone through argillaceous limestone and calcareous clay into glauconitic calcareous sand.

In addition to *H. gyralis*, the larger Foraminifera *Miscellanea nassauensis* Applin and Jordan, *Pseudophragmina (Proporocyclina) cedarkeysensis* Cole, and *Lockhartia sp.* are considered characteristic of the Oldsmar Formation.

Underfuentiated Lower Eocene Bocks—Lower Eocene rocks in the western part of the Florida panhandle consist of brownish to greenish-gray, calcareous, slightly glauconitic shale and siltstone that are occasionally micaceous. Thin beds of fine-grained, slightly glauconitic sandstone and off-white sandy glauconitic limestone occur sporadically throughout the predominantly argillaceous section. These rocks are part of the unit that was called the "clastic facies of Wilcox age" by Applin and Applin (1944) and the "Wilcox Formation" by Chen (1965). Both Chen and the Ap-

plins included beds that are the downdip equivalents of the Nanafalia Formation, the Tuscahoma Formation, and the Salt Mountain Limestone in their "Wilcox" unit. In this report, the Nanafalia, Tuscahoma, and Salt Mountain are considered to be of Paleocene age and to grade downdip into undifferentiated argillaceous rocks of Paleocene age. The term "undifferentiated early Eocene rocks" is herein applied to the massive, predominantly argillaceous early Eocene section of western panhandle Florida. These strata grade eastward into the Oldsmar Formation and become less marine and slightly coarser grained updip in southern Alabama and southwestern Georgia, where they take on the character of the outcropping Hatchetigbee Formation.

Microfauna considered characteristic of undifferentiated rocks of early Eocene age include the Foraminifera Globorotalia formosa gracilis Bolli and Rotalia trochoidiformis (Lamarck). The Foraminifera Globorotalia subbotinae Morozova and G. wilcoxensis (Cushman and Ponton) are also considered characteristic of early Eocene rocks in the study area, even though these species are known to range downward into rocks of late Paleocene age elsewhere (Stainforth and others. 1975). The Ostracoda Brackhevthere jessupensis Howe and Garrett and Haplocytheridea sabinensis (Howe and Garrett) are also considered characteristic of these beds.

Bashi and Hatchetigbee Formations—The lithology of the Hatchetigbee Formation in the area where it crops out in western Alabama is very similar to that of the underlying Tuscahoma. In practice, the two are difficult to separate except where the sandy, glauconitic, highly fossiliferous Bashi Formation (Gibson, 1982b) lies between them. The Bashi occurs only as erosional remnants in eastern Alabama and western Georgia. Downdip, the Hatchetigbee consists of interbedded fine sand and gray calcareous clay. The sand is lost in a short distance gulfward, and the argillaceous Hatchetigbee beds merge in middip areas with the underlying clay of the Tuscahoma.

Unnamed MID-Georgia Lower Eocene rocks—In the west-central part of the Georgia coastal plain, lower Eocene rocks consist of medium-grained, calcareous, often dolomitic, glauconitic sandstone interbedded with soft, light-gray, calcareous, glauconitic clay. The sandstone ranges from unconsolidated to well indurated, depending on the amount of calcareous matrix that binds the sand grains. Although these strata are the probable equivalents of the combined Hatchetigbee Formation of eastern Alabama and southwestern Georgia, they are unnamed at present and are not shown on the correlation chart (pl. 2) because their relation to the Hatchibtigbee is still inexactly known.

Georgia and peninsular Florida appear to die out downward within the middle Eocene. An exception is the fault in Palm Beach County, Fla., which cuts rocks at least as old as Paleocene (pl. 3). The series of northeast-trending faults in south-central Georgia bounds several small grabens and half grabens that are collectively called the Gulf Trough (Herrick and Vorhis, 1963). Like most of the faults in peninsular Florida, the Gulf Trough faults appear to die out at shallow depths. A seismic profile was obtained across one of the major Gulf Trough faults in northeastern Colquitt County, Ga., as part of this study. The record on this profile is poor down to a depth of approximately 1,200 ft below land surface. Deeper than about 1,300 ft (roughly the middle of rocks of middle Eocene age), however, sharp reflectors can easily be traced on the profile and do not show the graben structure that well data prove to exist at shallower depths.

The maximum measured depth to the top of the middle Eocene is 3,490 ft below sea level in well ALA-BAL-30 in southwestern Baldwin County, Ala. The maximum contoured depth is below 3,700 ft in the same area (pl. 6). The top of the middle Eocene slopes in all directions from the crest of the Peninsular arch and reaches depths of more than 1,800 ft in the Southwest Georgia embayment, more than 1,600 ft in the South Florida basin, and more than 1,000 ft in the Southeast Georgia embayment. Middle Eocene rocks are slightly above sea level at scattered places on the Peninsular arch. They are exposed at the surface in Citrus and Levy Counties, Fla., where they represent the oldest outcropping rocks in the state.

The thickness of middle Eocene rocks is shown on plate 7, which also shows the limits of the unit's clastic and carbonate facies. The position of the interface between these facies is approximate because it is based on well control. The thickness trends shown on plate 7 have been extended in areas where well control is scattered by subtracting the contoured tops of rocks of early and middle Eocene age. From a featheredge in outcrop areas, the middle Eocene thickens seaward to more than 1,200 ft in the Southwest Georgia embavment and to more than 1.000 ft in southeastern Georgia. Along panhandle Florida's Gulf Coast, these strata are more than 900 ft thick. They thin to less than 500 ft over the crest of the Peninsular arch and thicken southward to more than 1,600 ft in east-central peninsular Florida. Although the middle Eocene is between 1.000 and 1.400 ft thick in most of southern Florida, the unit thins to less than 900 ft in part of the South Florida basin, and shows that this basin was not subsiding rapidly during middle Eocene time.

Avon Park Formation—Applin and Applin (1944, p. 1686) applied the name Avon Park Limestone to the

upper part of the late middle Eocene section in a well at the Avon Park Bombing Range in the southernmost part of Polk County, Fla. They referred to the Avon Park as "a distinct faunal unit" and described it as "mainly cream-colored, highly microfossiliferous, chalky limestone" that locally contains some gypsum and chert and that is commonly partially dolomitized. Well cuttings examined during this study show that the Avon Park is in many places composed almost entirely of dolomite. The Avon Park is thus referred to in this report as a "formation" rather than a "limestone."

The term Lake City Limestone was introduced by Applin and Applin (1944, p. 1693) for the lower part of rocks of middle Eocene age in a well at Lake City in Columbia County, Fla. The Lake City was described as "alternating layers of dark brown and chalky limestone": gypsum and chert are present in some wells. Regionally, the lower part of the middle Eocene, like the upper part, contains much dolomite.

In the early 1940's, there were few deep wells in Florida, and the samples from many of these wells were either contaminated or incomplete. Electric logging was a new technique at the time, and those few logs that were in existence were largely unreliable. A common practice in subsurface stratigraphy was to use paleontologic and lithologic units interchangeably. All of these factors led to imprecise definitions for most of the limestone units of Florida. Between some adjacent "formations," lithologic change is subtle: in places, there is no change at all. Stratigraphic breaks in much of the Florida section currently are based upon a change in the benthic microfauna that the rocks contain. Where dolomitization has obliterated the microfauna, or where it is lacking in nondolomitized sections, correlations are inconsistent. Although most workers studying the Florida subsurface recognize the problem, almost all Tertiary limestone correlations are still made on the basis of the microfaunal assemblages that Applin and Applin (1944) and Applin and Jordan (1945) thought were diagnostic. This practice is, of course, not in accordance with the rules of the current North American Stratigraphic Code (North American Commission on Stratigraphic Nomenclature, 1983). Units that are in reality biostratigraphic units have been mapped as if they were rock-stratigraphic units. Fortunately, as Winston (1976), recognized, the paleontologically defined units of Applin and Applin (1944) in many cases coincide with lithologic units. Exceptions to this generalization are the Avon Park and Lake City Limestones.

There are no lithologic criteria that can be used to separate the middle Eocene carbonate rocks in Florida and in southern Georgia. Both the so-called Avon Park and Lake City Limestones consist primarily of

cream, tan, or light-brown, soft to well-indurated limestone that is mostly pelletal but is locally micritic. The pellets consist of fine to coarse sand-sized particles of micritic to fine crystalline limestone and small- to medium-sized Foraminifera; they are bound by a micritic to finely crystalline limestone matrix. The limestone is thinly to thickly interbedded with cream or light- to dark-brown, fine to medium crystalline, slightly vuggy dolomite, fractured in some places, whose texture is locally sucrosic to argillaceous. Locally, differences exist between the general lithologic character of the lower part of the middle Eocene and that of its upper part. Unfortunately, two of the limited number of wells available to the Applins (the Avon Park Bombing Range and Lake City wells) showed such contrasts, and it was on the basis of the limited data then available that the Avon Park and Lake City were named and extended regionally. More recent drilling shows conclusively that the rock types that the Applins thought were representative of their "Lake City" are found in many places at the top of the middle Eocene (in their "Avon Park" part) and the reverse is also true.

Paleontologic criteria by which the Avon Park and Lake City can be differentiated are lacking. In the original definition of both the Avon Park and the Lake City, certain faunal zones by which these units could be recognized were listed. The Lake City was thought to extend from the highest occurrence of Dictyoconus americanus (Cushman), accompanied by Fabularia vaughani Cole and Porter, down to the highest occurrence of Helicostegina gyralis Barker and Grimsdale, thought to characterize the Oldsmar. None of these species is restricted to the horizon for which it is supposed to be characteristic. H. gyralis commonly occurs several hundred feet above a typical Oldsmar lithology. In this study, Fabularia vaughani has been found at or just below the top of the middle Eocene-in the "Avon Park" part. Dictyoconus americanus has been reported by Cole (1944, 1945) and by Vernon (1951) from the upper part of the middle Eocene. The author has found several additional species that were listed as diagnostic Lake City Foraminifera by Applin and Jordan (1945) within 20 to 50 feet of the top of the uppermost middle Eocene. These species include Discorbis inornatus Cole, Fabularia gunteri Applin and Jordan, and Gunteria floridana Cushman and Ponton. Cole and Gravell (1952) found several supposedly diagnostic Lake City species in the same beds as supposedly diagnostic Avon Park species in the outcropping middle Eocene of Cuba. The Avon Park was originally defined by Applin and Applin (1944) as extending from the highest occurrence of Coskinolina floridana Cole downward to the top of Dictyoconus americanus. As Applin and Applin (1944, p. 1687), recognized, however. that Coskinolina floridana is abundant in the Oligocene Suwannee Limestone in many places.

The so-called Avon Park and Lake City Limestones cannot be distinguished from each other on the basis of either lithology or fauna, except locally. Therefore, it is here proposed that the term "Lake City" be abandoned and that all of the cream to brown pelletal limestone and interbedded brown to cream dolomite of middle Eocene age in peninsular Florida and southern Georgia be placed in the Avon Park Formation. The term "Avon Park" is retained because (1) it has precedence over the term "Lake City," (although both the Avon Park and the Lake City were named in the same report by Applin and Applin (1944), the Avon Park was described on an earlier page in that paper) and (2) the term has traditionally been applied to rocks whose lithology is different from that of the overlying Ocala Limestone. The Avon Park is more properly called a "formation" rather than a "limestone" because it contains appreciable amounts of rock types other than limestone. The extended definition of the Avon Park Formation proposed here refers to the sequence of predominately brown limestones and dolomites of various textures that lies between the gray, largely micritic limestones and gray dolomites of the Oldsmar Formation and the white foraminiferal coquina or fossiliferous micrite of the Ocala Limestone.

The reference section proposed for the extended Avon Park Formation is the interval from 221 to 1,190 ft below land surface in the Coastal Petroleum Company's No. 1 Ragland well in sec. 16, T. 15 S. R. 13 E, in Levy County, Fla. Cuttings from this well are on file at the Florida Bureau of Geology, Tallahassee, Fla., as well W-1537 or permit number 66. The well is numbered FLA-LV-4 in this report. A lithologic description of the cuttings from the proposed type well is given in the Appendix of this report. The top of the Avon Park is not known in the type well because there is a gap in the cuttings from the basal Ocala at a depth of 110 ft to the uppermost Avon Park sample at 221 ft. Figure 5 shows a representative electric log pattern for the Avon Park Formation (extended) in a nearby well in Levy County, Humble's No. 1 C. E. Robinson (well FLA-LV-5 of this report).

Fauna considered characteristic of the revised Avon Park Formation include the Foraminifera Spirolina coreyensis (Cole), Lituonella floridana (Cole), Discorbis inornatus Cole, Valvulina cushmani Applin and Jordan, V. martii Cushman and Bermudez, Fabularia vaughani Cole and Ponton, Textularia coreyensis Cole, Gunteria floridana Cushman and Ponton, Pseudorbitolina cubensis Cushman and Bermudez, Amphistegina lopeztrigoni Palmer, and Lepidocyclina antillea Cushman (formerly called L. gardnerae Cole). Fragments of the alga Clypeina infundibuliformia Morellet

and Morellet are also considered characteristic of the Avon Park.

To the north and west, the Avon Park Formation grades into an argillaceous, soft to semi-indurated, micritic. glauconitic limestone that in turn grades updip into calcareous, glauconitic, often shelly sand and clay beds that are parts of the Lisbon and Tallahatta Formations. The middle third of the revised Avon Park Formation in the eastern half of the Florida peninsula and in much of southeastern Georgia is micritic, low-permeability, finely pelletal limestone. Approximately the lower half of the extended Avon Park in west-central peninsular Florida consists of low-permeability dark-colored gypsiferous limestone and dolomite. Both the micritic limestone and the gypsiferous carbonate beds comprise important subregional confining units within the Floridan aquifer system.

Talliahatta Formation—Where the Tallahatta Formation crops out in western Alabama, it consists largely of greenish-gray, porous, fine-grained siliceous claystone (called buhrstone in older reports) and some interbedded sands that are calcareous and fossiliferous near the top of the unit. In eastern Alabama, the outcropping Tallahatta is mostly poorly sorted, occasionally gravelly sand interbedded with greenish-gray clay and calcareous sand near the top. In southwestern Georgia, the outcropping Tallahatta is somewhat more marine than it is in Alabama and consists of fine-to coarse-grained slightly fossiliferous sand interbedded with dark-brown, silty, micaceous, occasionally glauconitic limestone. Chert is common near the base of the Tallahatta in updip areas in Georgia.

Downdip, in both Alabama and Georgia, the Tallahatta consists largely of interbedded gray to greenish-grav glauconitic sand and greenish-grav to brownish-gray shale; light- to dark-brown glauconitic fossiliferous limestone is common. Farther seaward in Georgia, the Tallahatta grades into cream to light-gray glauconitic, argillaceous, somewhat sandy limestone that in turn grades into the revised Avon Park Formation. Along and just to the north of the Gulf Coast of Alabama and western panhandle Florida, the Tallahatta consists mostly of gray to greenish-gray clay and thin to moderately thick interbeds of fine-grained, glauconitic, calcareous sand. Neither the limestone facies nor the calcareous clay and sand of western Florida and southern Alabama can be distinguished from similar overlying strata that are considered to be the Lisbon Formation in this study. In northeastern Georgia, the Tallahatta is mostly gray, calcareous, fossiliferous clay and has a thin sequence of calcareous sand and glauconitic limestone at the base. These strata grade northeastward into calcareous shelly sand

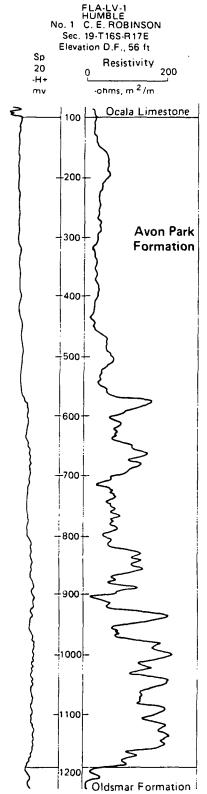


Figure 5. Representative electric log pattern for the Avon Park Formation.

part of peninsular Florida, they are less than 100 ft thick in an area that trends east-west across the peninsula. There is much local variation in the thickness of the upper Eocene because of the effects of erosion and (or) dissolution of these rocks, especially in and near the places where they crop out.

OCALA LIMESTONE—Dall and Harris (1892) applied the name Ocala Limestone to the limestone exposed in quarries near Ocala in Marion County, Fla. These rocks were incorrectly correlated with strata in Alabama that were thought then to be Eocene but that are now known to be of Oligocene age. Cooke (1915) was the first to assign the Ocala to its correct upper Eocene stratigraphic position. Applin and Applin (1944) divided the Ocala into upper and lower members. This twofold division of the formation is still used by the U.S. Geological Survey at the time of this writing (1984). However, the Florida Bureau of Geology considers the Ocala to be a group consisting of, in ascending order, the Inglis, Williston, and Crystal River Formations, as Puri (1953b) proposed.

Puri's three formations cannot be recognized lithologically even at their type sections and cannot be differentiated in the subsurface. This author does not consider the Inglis, Williston, and Crystal River Formations to be either readily recognizable nor mappable, and the terms are not used in this report. As Applin and Applin (1944) recognized, the Ocala consists in many places of two different rock types. The upper part of the Ocala is a white, generally soft, somewhat friable, porous coquina composed of large Foraminifera, bryozoan fragments, and whole to broken echinoid remains, all loosely bound by a matrix of micritic limestone. This coquina is the typical Ocala of the literature and comprises much of the formation. The lower part of the Ocala consists of cream to white, generally fine grained, soft to semi-indurated, micritic limestone containing abundant miliolid remains and scattered large foraminifers. Locally, in southern Georgia, the lower part of the Ocala is slightly glauconitic. This lower fine-grained facies of the Ocala is not everywhere present and may locally be dolomitized wholly or in part. In southern Florida, the entire Ocala is composed of micritic to finely pelletal limestone in places. Because the twofold division of the Ocala is not everywhere recognizable and because the lower micritic unit is thin where it occurs, the two members are not differentiated in this report.

The Ocala Limestone is found throughout Florida (except where it has been locally removed by erosion) and underlies much of southeastern Alabama and the Georgia coastal plain. The Ocala is one of the most permeable rock units in the Floridan aquifer system. The surface of the formation is locally very irregular as

a result of the dissolution of the limestone and the development of karst topography. Locally, the upper few feet of the Ocala in the subsurface consist of white, soft, clayey residuum. Where the formation is exposed at the surface, such residuum may also be present (as in southwestern Georgia), but the clayey material is ocher to red there owing to the oxidation of the small amounts of iron that it contains.

Fauna considered characteristic of the Ocala Limestone include the Foraminifera Amphistegina pinarensis cosdeni Applin and Jordan. Lepidocyclina ocalana Cushman, L. ocalana floridana Cushman. Eponides jacksonensis (Cushman and Applin), Gyroidina crystalriverensis Puri, and Operculina mariannensis Vaughn. Although the foraminiferal genus Asterocyclina is not restricted to the late Eocene, it usually is not found above the top of the Ocala in the study area. The Ostracoda Cytheretta alexanderi Howe and Chambers and Jugosocythereis bicarinata (Swain) are found in shallower water parts of the Ocala as well as in its clastic equivalents.

Moody's Branch Formation—In western panhandle Florida, the Ocala thins and, although the upper part of the formation retains its typical coquinoid character, the lower part grades westward into soft gray clay and minor interbedded fine-grained sand. This lithology is correlative with the outcropping Moody's Branch Formation of western Alabama, which consists of greenish-gray, calcareous, glauconitic sand and clay and a few layers of sandy limestone.

YAZOO CLAY—The upper part of the Ocala in central Alabama grades northward and westward through a white, massive, fine-grained, clayey, glauconitic limestone into the outcropping Yazoo Clay in western Alabama and eastern Mississippi. The Yazoo can be locally divided into four members (Murray, 1947), (from oldest to youngest): (1) the North Twistwood Creek Clay, a bluish-gray, sandy, slightly calcareous. fossiliferous clay; (2) the Cocoa Sand, a yellowish-gray, fine- to medium-grained, massive, fossiliferous sand; (3) the Pachuta Marl, a light greenish-gray, clayey, fossiliferous, calcareous sand or sandy limestone; and (4) the Shubuta, a light-gray to white, calcareous, fossiliferous, sandy clay. These divisions of the Yazoo can be traced in the subsurface for only a short distance downdip from their area of outcrop.

Fauna considered to characterize the Yazoo Clay, its middip equivalents, and the basal clastic part of the Ocala in the Florida panhandle include the Foraminifera Bulimina jacksonensis Cushman, Robulus gutticostatus cocoaensis (Cushman), and Globigerina tripartita Koch. Ostracoda that characterize these beds include Cytheretta alexanderi Howe and Chambers.

sists of carbonate rocks throughout all of the study area except for southwestern Alabama, western panhandle Florida, and parts of northeastern Georgia and southwestern South Carolina, where clastic strata make up an important part of the Oligocene. The few scattered outliers of Oligocene lying between the two main bodies shown on plate 10, indicate that these rocks extended over a much wider area before being removed by erosion. Older rocks are exposed at scattered places within the widespread but generally thin body of the Oligocene in Georgia, where erosion has removed all of the Oligocene locally. The locations of most of the Oligocene outliers and the places where Oligocene rocks have been stripped are based on well data compiled for this study. A few of these features. however, are located from published sources, and thus lie in places where no well control is shown on plate 10. Erosional remnants to the north and west of the general updip limit of the Oligocene show that these rocks once extended over a much wider area.

Both large- and small-scale structural features affect the configuration of the Oligocene top. Largescale features include (pl. 10) (1) the steep gulfward slope of the unit in southwestern Alabama, which reflects subsidence of the Gulf Coast geosyncline, (2) the low area in southern Gulf County, Fla., that represents the Southwest Georgia embayment, (3) the negative area in Glynn County, Ga., and adjacent counties that is the Southeast Georgia embayment, and (4) a low area in southwestern peninsular Florida that may represent a remnant of the South Florida basin. The northwest-southeast orientation of the axis of the South Florida basin is different from its alinement on the surface of older rock units (compare, for example, pls. 8 and 10). The high area shown on the Oligocene surface along the Gulf of Mexico parallel to the South Florida basin is not present on the upper Eocene top. This high probably acted as a sill or barrier during Oligocene time and partly restricted open circulation between the South Florida basin and the ocean. Smaller structural features shown on plate 10 include the northeast-trending series of small grabens in central Georgia that are collectively called the Gulf Trough and a coast-parallel normal fault that extends from Indian River County southeast through Martin County, Fla. The Oligocene has been eroded from the upthrown side of this fault but is preserved on its downthrown side.

The Oligocene top slopes generally seaward from a high of more than 300 ft above sea level in the unit's outcrop area in central Georgia to slightly more than 600 ft below sea level in both the Southwest and Southeast Georgia embayments. This general seaward slope is interrupted in northern Florida by a high area extending from Leon County eastward to Columbia

County, where Oligocene rocks crop out. From a second outcrop area that extends southward from Citrus to Hillsborough Counties. Fla., Oligocene rocks slope into the South Florida basin, where the Oligocene top is more than 900 ft below sea level. The maximum measured depth to the top of the Oligocene is about 2.680 ft below sea level in well ALA-BAL-30 in southern Baldwin County, Ala. The maximum contoured depth is below 3.200 ft, to the southwest of this well. Although the top of the Oligocene is affected locally by erosion and karst topography, it is not as irregular as the top of upper Eocene strata.

The thickness of the Oligocene Series is shown on plate 11. Most of the contouring shown on this plate is based on well data. Where wells are scattered, the thickness of Oligocene rocks has been estimated by subtracting contours that represent the tops of upper Eocene and Oligocene rocks (pls. 8 and 10). Oligocene strata are generally less than 200 ft thick in the study area. Exceptions are southwestern Florida, where these rocks are more than 400 ft thick; southern Gulf and Franklin Counties. Fla., where they are more than 600 ft thick: and the southernmost part of Alabama. where they are more than 800 ft thick. These thick areas represent the South Florida basin, the Southwest Georgia embayment, and the northeastern rim of the Gulf Coast geosyncline, respectively. Throughout most of eastern Georgia and all of South Carolina, the thickness of the Oligocene Series only locally exceeds 100 ft and is generally 50 ft or less.

SUWANNEE LIMESTONE AND EQUIVALENT ROCKS

The name "Suwannee Limestone" was proposed by Cooke and Mansfield (1936, p. 71) for "yellowish limestone typically exposed along the Suwannee River in Florida, from Ellaville...almost to White Springs...." They considered these beds to be of Oligocene (Vicksburgian) age rather than Miocene as previous investigators had postulated. Cores and well cuttings examined during this study show that the Suwannee usually consists of two rock types: (1) cream to tan, crystalline, highly vuggy limestone containing prominent gastropod and pelecypod casts and molds and (2) white to cream, finely pelletal limestone containing small foraminifers and pellets of micrite bound by a micritic to finely crystalline limestone matrix. Although these two rock types are complexly interbedded in places, the pelecypod cast-and-mold limestone is more characteristic of the upper part of the Suwannee and is the lithology most representative of the entire formation in most of Georgia and eastern panhandle Florida. The micritic pelletal limestone that is characteristic of the lower part of the Suwannee is locally

found higher in the formation in southwestern Florida. Because the Suwannee, like the Ocala, cannot be divided everywhere, the two facies have not been delineated in this report.

The upper part of the Suwannee has been locally silicified, and this chert-rich horizon was named the Flint River Formation in Georgia. These silicified beds are rarely found in the subsurface and appear to merely represent local diagenetic conditions rather than a widespread mappable variation within the Suwannee. The term Flint River is accordingly not considered to be a valid formational name in this report.

The upper part of the Suwannee in the Georgia subsurface commonly consists of medium to coarsely crystalline, light-brown to honey-colored, saccharoidal, vuggy dolomite. The erosional remnants of Suwannee preserved as outliers several miles distant from the main bodies of Oligocene rocks (pl. 10) and consisting of either limestone or dolomite show that marine Oligocene strata once covered the entire study area. Locally, the cast-and-mold facies of the Suwannee contains fine-grained sand. Very locally, the micritic pelletal facies contains trace amounts of fine- to mediumgrained, light- to dark-brown phosphate. In outcrop, the Suwannee locally weathers to a nodular, rubbly surface owing to the removal of layers, lenses, and stringers of soft argillaceous limestone.

The Suwannee grades northward in northeastern Georgia and South Carolina into part of the Cooper Formation by the addition of clav and sand and the loss of limestone. Westward, across panhandle Florida and southern Alabama, the Suwannee appears to grade into the lower part of the Bucatunna Formation. In that area, the Suwannee consists of tan limestone, dolomitic limestone, and light-colored calcareous clay. Some of these beds were called "Byram" or "Glendon" by early workers (Cooke and Mossum, 1929; Cooke, 1945) primarily on the basis of their stratigraphic position. Some faunal aspects of the Suwannee in Florida are Chickasawhayan (late Oligocene); others are Vicksburgian (early Oligocene). The unit is thus interpreted in this report as spanning both ages (pl. 2). The Suwannee in Georgia is thought to be late Oligocene (Huddlestun, 1981).

Microfauna considered characteristic of the Suwannee include the larger Foraminifera Lepidocyclina leonensis Cole and L. parvula Cole as well as the small Foraminifera Pararotalia byramensis Cushman and P. mexicana mecatepecensis Nutall, which are closely related. Although the genus Miogypsina ranges into younger strata in the central Gulf Coast, it does not occur above the top of the Suwannee in the study area. The larger Foraminifera Discorinopsis gunteri Cole, Dictyoconus cookei (Moberg), and Coscinolina floridana Cole are commonly found in the Suwannee.

but these three species are also found lower in the section in the middle Eocene Avon Park Formation. Some authors think that these species have been reworked from the Avon Park into the Suwannee. Others think that they are merely long-ranging species that are "facies seekers." That is, their reappearance in the Suwannee means nothing more than the reestablishment of environmental conditions like those in which the Avon Park was deposited. Most individuals of these three species from the Suwannee examined during this study appeared fresh and unaltered, and the species are widespread throughout the cast-andmold facies of the formation. In addition, there is no apparent Avon Park source from which these fossils could have been reworked. The isolated patches of Avon Park that are exposed through a cover of upper Eocene sediments (pl. 8) are too small and too scattered to provide a source from which these widely distributed Foraminifera could have been reworked into the Suwannee. This author therefore believes that these are long-ranging species indigenous to the Suwannee Limestone.

BUMPNOSE, RED BLUFF, AND FOREST HILL FORMATIONS

In panhandle Florida, the Oligocene Series thickens considerably (pl. 11) and becomes increasingly clastic westward. In addition, some carbonate units that are older than the Suwannee are present at the base of the Oligocene (pl. 2). One such unit is the Bumpnose Formation, a name applied by Moore (1955) to a soft. white, somewhat glauconitic, highly fossiliferous (pelecypod and gastropod casts and molds and bryozoan and foraminiferal remains) limestone that crops out in central Jackson County, Fla. Moore thought that the Bumpnose represented the uppermost part of the late Eocene but recognized that many of its faunal elements were Oligocene. Subsequent work by Hazel and others (1980) confirmed the findings of MacNeil (1944) and Cooke (quoted by Moore, 1955, p. 38) that the beds that Moore called Bumpnose correlate with the Red Bluff Formation of Alabama of known Oligocene age. The Bumpnose in its type area is very likely a transitional unit between the late Eocene and early Oligocene. The Bumpnose Formation, however, is placed in the Oligocene in this report because carbonate rocks in western Alabama that are in the same stratigraphic position as the Bumpnose and that can be shown to correlate with it are of Oligocene age (Hazel and others. 1980).

The Bumpnose grades northwestward into the Red Bluff Formation, which is mostly dark-gray to brown, fossiliferous, glauconitic clay that contains some iron-

UPPER CONFINING UNIT

Over much of the study area, the Floridan aquifer system is overlain by an upper confining unit that consists mostly of clastic rocks but locally contains much low-permeability limestone and dolomite in its lower parts. In places, the upper confining unit has been removed by erosion, and the Floridan either crops out or is covered by only a thin veneer of permeable sand that is part of the surficial aquifer. Because the lithology and thickness of the upper confining unit are highly variable, the unit retards the vertical movement of water between the surficial aquifer and the Floridan aquifer system in varying degrees. Where the upper confining unit is thick or where it contains much clay, leakance through the unit is much less than where it is thin or highly sandy. In these thick or clay-rich areas, therefore, water in the surficial aquifer moves mostly laterally and is discharged into surface-water bodies rather than moving downward through the upper confining unit (when the head differential is favorable) to recharge the Floridan aquifer system.

The upper confining unit may be breached locally by sinkholes and other openings that serve to connect the Floridan aguifer system directly with the surface. These sinkholes are for the most part found where the thickness of the upper confining unit is 100 ft or less. They appear to result from the collapse of a relatively thin cover of clastic materials into solution features developed in the underlying limestone of the Floridan aquifer system rather than from the solution of limestone beds within the upper confining unit itself. The upper confining unit is generally more sandy where it is less than 100 ft thick because these relatively thin areas represent upbasin depositional sites where coarser clastic rocks were laid down. Plate 25 shows the extent and thickness of the upper confining unit. The maximum measured thickness of the unit is about 1.890 ft in well ALA-BAL-30 in Baldwin County, Ala. The maximum contoured thickness is 1,900 ft. Plate 25 also shows areas where water in the Floridan aguifer system occurs under unconfined, thinly confined (thickness of upper confining unit between 0 and 100 ft), and confined conditions.

The upper confining unit includes all beds of late and middle Miocene age, where such beds are present. Locally, low-permeability beds of post-Miocene age are part of the upper confining unit. Over most of the study area, middle Miocene and younger strata consist of complexly interbedded, locally highly phosphatic sand, clay, and sandy clay beds, all of which are of low permeability in comparison with the underlying limestone of the Floridan aquifer system. Locally, low-permeability carbonate rocks that are part of the lower

Miocene Tampa Limestone or of the Oligocene Suwannee Limestone are included in the upper confining unit. Very locally, in the West Palm Beach, Fla., area, the uppermost beds of rocks of late Eocene age are of low permeability and are included in the upper confining unit.

Parker and others (1955) and Stringfield (1966) included basal beds of the Hawthorn Formation in their Floridan and principal artesian aquifers where those beds are permeable. In a few isolated cases (for example, in Brevard County, Fla.), the lowermost Hawthorn strata are indeed somewhat permeable, but their permeability is considerably less than that of the underlying Floridan aquifer system, as Parker and others (1955, p. 84) recognized. Locally, in parts of southwestern Florida (Sutcliffe, 1975; Boggess and O'Donnell, 1982) and west-central peninsular Florida (Ryder, 1982), permeable zones within the Hawthorn Formation are an important source of ground water over a one- or two-county area. Although some of these permeable zones are limestones, their transmissivity is at least an order of magnitude less than that of the Floridan aguifer system, and they are separated from the main body of permeable limestone (Floridan) by thick confining beds. Because of their limited areal extent, relatively low permeability, and vertical separation from the Floridan aquifer system practically everywhere, water-bearing Hawthorn limestones are excluded from the Floridan in this report.

Where the limestone and dolomite of the Floridan crop out, a clayey residuum may form over the carbonate rocks as a result of chemical weathering that dissolves the carbonate minerals and concentrates trace amounts of clay that are in them. Such residumm is particularly well developed in the Dougherty Plain area of southwestern Georgia (Hayes and others, 1983). Although this residuum is a low-permeability material and may very locally form a semiconfining layer above the limestone, it is usually thin and laterally discontinuous. Accordingly, the clayey residuum is not included in this report as part of the upper confining unit of the Floridan aquifer system.

Because the rocks that comprise the upper confining unit vary greatly in lithology, are complexly interbedded, and for the most part are of low permeability, little is known about their hydraulic characteristics. Where clay beds are found in the Hawthorn Formation, they are usually very effective confining beds. Vertical hydraulic conductivity values for Hawthorn clays, as established from core analysis and from aquifer tests, range from 1.5×10^{-2} ft/d (Hayes, 1979) to 7.8×10^{-7} ft/d (Miller and others, 1978). Where sandy beds of the Hawthorn comprise a local aquifer, transmissivity values for the sand range as high as

NUS CORPORATION AND SU	UBSIDIARIE:	TELECON NOTE
	REFERENCE # 24	
CONTROL NO.	DATE: October 8, 1990	TIME: 1400
DISTRIBUTION:	- 	
AMAX Phosphate		
BETWEEN: Arnold Becken	OF : Hillsborough County Water Distribution	PHONE: (813) 968-4825
AND: Maureen Gordon, NUS Co	rporation Misson	·
DISCUSSION:		
The water lines for Hillsborough C	ounty do not cross the Manatee River. The	y end south of Ruskin.
J	·	•



Southwest Florida REFERENCE : 25 Water Management Donner

2379 Broad Street (U.S. 41 South) Brooksville, Florida 34609-6899 Phone (904) 796-7211 or 1-800-423-1476 SUNCOM 628-4150

Charles A. Black Chairman, Crystal River Roy G. Harrell, Jr. Vice Chairman, St. Petersburg Anne Bishopric Sager Secretary, Venice Joseph S. Casper Treasurer, Tampa Mary Ann Hogan Brooksville Samuel D. Updike Lake Wales Gordon D. Hartman Bradenton David H. Knowlton St. Petersburg Andrew J. Lubrano Tampa Abby Misemer New Port Richey Sally Thompson

Peter G. Hubbell
Executive Director
Mark D. Farrell
Assistant Executive Director
Kent A. Zaiser
General Counsel

Tampa

September 27, 1990

Ms. Maureen M. Gordon NUS. Corporation 1927 Lakeside Pkwy., Suite 614 Tucker, Georgia 30084

SUBJECT: Well Construction Permit Listing

Dear Ms. Gordon

Enclosed you will find copies of the above referenced listing for the areas outlined in your letter dated September 6, 1990.

If I can be of any further assistance, please contact this office.

Sincerely,

JAMÉS P. MARSHALL Well Construction Permit Coordinator

/JPM



1927 LAKESIDE PARKWAY SUITE 614 TUCKER. GEORGIA 30084 404-938-7710

C-586-9-0-55

September 6, 1990

Mr. Jim Marshal 2379 Brood Street Brooksville, FL 34609-6899

Dear Mr. Marshal:

I am doing a site investigation of AMAX Phosphate Facility (Royster) in Palmetto for Superfund. Could you please send me a listing of all wells (private, municipal, industrial) within a 4-mile radius. The latitude of the site is 27°37′24" and the longitude, 82°31′54′. The following is a listing of Sections, Townships, and Ranges included in the 4-mile radius:

Approved:

Sections 13-36, Township 32S, Range 18E Sections 1-36, Township 33S, Range 18E Sections 1, 12, 13, 23-27, 34, 35, Township 33S, Range 17E

Very truly yours,

Maureen M. Gordon, Ph.D.

Maurece Doods

Project Manager

MMG/tb

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SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT DATE 9/27/90 5:16:39 PAGE WELL CONSTRUCTION PERMITTING PERMIT SUMMARY FROM: 00/00/00 TO 99/99/99 R080055 EY: COUNTY: BASIN: S: 1 - 36 T:33 P:18 DEPTH: 0 TO 9999 DIAMETER: 0 TO 99 METHOD: USE: CASE DEPTH: SWL S TAE PC В G Ε ВТ ATV R H I S TEE CL T DRILL U LOCATION I CASE WELL U BG O IRL U LICH S I A O A DEPH DEPH T RS D C PERMIT S NUMBE E N Y QQQ STR PRNF USER-ID LOT OWNER NAME 300040 C 1627 D 21 081 0 0 193318 110 N OC 28 76-097 NO FRISBIE. ANNIE 40 265 21 081 0 0 193318 D R 302945 C 1013 D 9 79-194 NO MARD. JACK 446557 I 1360 D 21 081 0 0 193318 30 233 0 C COCO NO CLOSE BILL 30 170 446558 I 1360 D 21 081 0 0 193318 n c 2 0000 NO CLOSE BILL 44777C K 1737 D 21 081 O D 193318 4 *** CANCELLED *** LOYER, VAL 700922 C 1627 D 21 081 0 0 193318 HORNSBY, GARY ח 21 081 0 0 193318 701207 C 1013 FRENCH, TIM 701226 C 1627 D 21 081 0 0 193318 SMITH, CARL 464430 I 1627 D 21 081 0 0 193318 0000 60 200 Y 18 R 10 . NO WYMAN, GREEN & BLALOCK/DOOM, DON 448674 1 2870 H 21 081 0 0 193318 WINTERSIT PARK 448837 I 1627 L 21 081 0 U 193318 100 100 Y 27 R 0000 NO SIPE. HIKE 448562 I 1974 G 21 081 0 0 193318 SWEWND 448563 I 1974 0 21 081 D 0 193318 SWFWMD 472938 I 1627 A 21 081 0 0 203318 60 340 Y 18 R 0000 NO HUTTINGER, CAROL 51 701119 C 1627 D 21 081 D 0 203318 VER STRATE, CHRIS 4466.3 I 1627 D 21 081 0 C 203318 40 100 Y 12 R 0000 NO AYRES WILLIAM 93 196 Y 16 R 470229 T 1627 D 21 081 0 0 263318 STINSON. KIM 68 0000 N O 447239 N 1979 Υ 21 081 0.0 203318 3 *** CANCELLED *** SWFWMD 78-308 301608 C 1627 A 21 081 0 0 213318 276 453 N 0 T 11 B H B NO GOEBEL. CLYDE 396135 C 2263 A 15 053 D 0 213318 84 120 N O C a 000000 NO DRUMMOND. DAN 447762 N 1376 D 21 081 0 0 213318 5 *** CANCELLED *** STEVENS, JOHN 700622 C 1360 I 21 081 0 0 213318 AMERSON, ROY 463977 N 2368 0 21 081 0 0 223318 2 *** CANCELLED *** MANATEE CO. UTILITIES DEPT. 463978 N 2368 0 21 081 0 0 223318 2 *** CANCELLED *** MANATEE CO. UTILITIES DEPT. 470256 1 2831 0 21 081 0 0 223318 BLOSSEM GROVES 21 081 0 0 223318 470257 I 2831 0 2 BLOSSEM GROVES 470258 I 2831 0 21 081 0 0 223318 BLOSSEM GROVES 470259 I 2831 0 21 081 0 0 223318 BLOSSEM GROVES 470252 I 2831 0 21 081 0 0 243318 MC CLURE FARMS 470253 I 2831 21 081 0 0 243318 MC CLURE FARMS 447492 I 1627 D 21 081 0 0 253318 40 100 Y 12 R ALLIGOOD, MIKE 0000 701108 C 1627 A 21 081 0 0 263318 PURSLEY TURF FARMS 448179 I 1376 I 21 081 0 0 263318 340 700 Y 25 R 0000 NO MANATEE CO. UTILITIES 463973 N 2368 21 115 0 0 263318 *** CANCELLED *** 0 MANATEE CO. UTILITIES DEPT. 470266 I 2831 0 21 081 0 0 263318 BLOSSEM GROVES 3131313 470267 I 2831 0 21 081 9 0 263318 BLOSSEM GROVES 470268 I 2831 0 21 081 0 0 263318 BLOSSEM GROVES 470269 I 2831 0 21 081 0 0 263318 BLOSSEM GROVES 447752 N 1376 Y 21 081 0 0 263318 MANATEE CO.UTILITIES 6 *** CANCELLED ***

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DATE 9/27/90 5:16:39 SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT PAGE WELL CONSTRUCTION PERMITTING PERMIT SUMMARY FROM: 00/00/00 TO 99/99/99 R080055 BASIN: BY: COUNTY: S: 1 - 36 T:33 R:18 DEPTH: O TO 9999 DIAMETER: O TO 99 METHOD: USE: CASE DEPTH: SWL S Ō TAE PC RBT ATV H I S T DRILL U ONAH TEE CL LOCATION I CASE WELL U BG O U LICH S T IRL A 0 0 Ĺ PERMIT S NUMBER E N Y QQQ STR A DEPH DEPH T RS D C PR F USER-ID OWNER NAME N 21 081 0 0 023318 33 118 0000 TOPEUN H.G. 445151 1 1051 21 081 0 0 023318 435606 N 2987 2 *** CANCELLED *** ELSBERRY INC. 435667 N 2987 11 081 0 0 023318 2 *** CANCELLED *** ELSBERRY INC. 4356E8 N 2987 0 21 081 0 0 023318 2 *** CANCELLED *** ELSBERRY INC. 4356U9 N 2987 0 21 081 0 0 023318 2 *** CANCELLED *** ELSBERRY INC. 470119 N 2C88 21 081 0 0 033318 4 *** CANCELLED *** EZSBERRY. BRUCE 21 081 0 0 053318 12 105 610 0000 CANNON, HARRY 449330 I 1376 0 C NO 449332 I 1376 21 081 0 0 053318 12 310 600 0 C 3. 0000 NO CONSOLIDATED MINERAL INC. 700627 C 2073 T 21 081 0 0 053318 uses COPO 447428 I 1360 A 21 081 0 0 063318 32 100 0 0 LOGGINS. CORBIN NO 28 92 370 Y 25 R 21 081 0 0 063318 0000 DEPARTMENT OF NATURAL RESOURCES 448625 I 1627 NO 448875 N 2684 21 081 0 0 063318 2 *** CANCELLED *** MANATEE CO. FACILITIES MGMT. 448876 N 2884 21 081 0 0 063318 2 *** CANCELLED *** MANATEE CO. FACILITIES MGMT. 21 081 0 0 063318 2 *** CANCELLED *** MANATEE CO FACLILTIES MEMT. 448879 N 2884 446880 N 2884 21 081 0 0 063318 2 *** CANCELLED *** MANATEE CO. FACILITIES MGMT. 0 464170 I 2884 O 21 081 0 0 063318 2 20 Y 1 A coca MANATEE CO.FACILITIES MANAGE. NO 22 N 0 C TF1531 374340 C GEOL T 21 081 0 0 063318 15 TAMPA ELECTRIC CO N O 21 081 0 0 073318 50 N 0 C 77-391 BARCO. W. S. 306585 C 1627 N O A 300037 C 1627 21 081 0 0 073318 390 N O C 12 AM 76-090 NO NICHOLS, DR FRED 21 081 0 0 073318 0000 SWITZER. MOREY(STARLITE CONST.) 448361 I 1627 63 260 Y 14 R 0 NO 469980 I 9033 21 081 0 0 073318 38 Y 5 R 0000 NO ROYSTER. CORP. 448698 N 2858 21 081 0 0 073318 2 *** CANCELLED *** COMMERCIAL CARRIER CORP. _0_ 448699 N 2858 0 21 081 0 0 073318 2 *** CANCELLED *** COMMERCIAL CARRIER CORP. COMMERCIAL CARRIER CORP. 4487UC N 2858 n 21 081 0 0 073318 2 *** CANCELLED *** 2 *** CANCELLED *** 448701 N 2858 21 081 0 0 073318 COMMERCIAL CARRIER CORP. 0 449666 I 2406 21 081 0 0 073318 FLORIDA POWER CORPORATION 0 21 081 0 0 073318 FLORIDA POWER CORPORATION 449667 I 2406 O 449668 I 2406 0 21 081 0 0 073318 FLORIDA POWER CORPORATION 449669 I 2406 0 21 081 0 0 073318 FLORIDA POWER CORPORATION coco ROYSTER COMPANY 470227 I 9033 45 65 Y 5 R 0 21 081 0 0 073318 NO 445134 1 1627 A 21 081 0 0 083318 DAVIS HOYT COCHRAN, ELBERT LEE 700356 C 1627 מ 21 081 0 0 083318 701148 C 1613 AUSTIN, BOB D 21 081 0 0 083318 448357 N 2372 21 081 0 0 083318 4 *** CANCELLED *** AMAX CHEMICAL CORP. 700628 C 2073 T 21 081 0 0 083318 uses USGS 700629 C 2073 21 981 9 9 983318 700630 C 2073 21 081 0 0 083318 USGS হাও ১৯ USGS 700841 C 2C73 T 21 081 0 0 083318 0000 REEDE RANCH 449237 I 1376 A 21 081 0 0 093318 10 340 815 O C 46 NO

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SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT DATE 9/27/90 5:02:12 PAGE **WELL CONSTRUCTION PERMITTING** RDB0055 - -- PERMIT SUMMARY FROM: 00/00/00 .TO 99/99/99 BY: COUNTY: BASIN: 5:13 - 36 1:32 R:18 DEPTH: 0 TO 9999 DIAMETER: 0 TO 99 METHOD: USE: CASE DEPTH: C SWL S Ë TAE R B T ATV HIS T DRILL U ONAH TEE CL R U LOCATION I CASE WELL U BG O U L ICN S -I IRL A O PERMIT S NUMBER E N Y QQQ STR A DEPH DEPH T RS D C PRNF USER-ID LOT Н OWNER NAME 321842 H 1336 11 057 0 0 133218 52 206 N 000000 NO WH CLARK 360809 C 1336 B 11 057 4 1 133218 62 215 Y 6 C 3 n 000000 NO WHISMAN. CLIFFORD F. В 11 057 0 0 133218 351555 E 1477 230 230 N 0 C 000000 NO MORGAN. VERNON 416627 I 2251 11 057 0 0 133218 147 242 Y 0 0000 NO CRISSEY, FLORENCE 307762 E 0009 D 11 057 1 1 133218 53 213 0 C 7 000000 NO M H SUMNER 320752 E 0000 D 11 057 4 1 133218 77 242 3 C 6 000000 NO. LEON LIMOGE 323223 E 1336 D 11 057 0 0 133218 200 0 C 10 000000 NO F DIAZ 25 26 27 28 326929 E 1477 D 11 057 0 0 133218 36 210 0 C 12. 000000 NO L DAVIS 326930 E 1477 11 057 0 0 133218 148 205 0 C 000000 12 D L GIBSON NO 332982 E 1160 11 057 0 0 133218 C 53 187 12 000000 N O D SIMPSON 333553 H 1336 11 057 0 0 133218 0 C D 3 58 212 7 000000 NO. DEBLY J D 338943 E 1160 D 11 057 0 0 133218 63 185 9 C 000000 NO. COOK . R L 338944 E 1160 D 11 057 0 0 133218 0 C 180 000000 NO WALKER . D I 200 N 0 C 376125 C 1336 Ð 11 057 1 4 133218 3 70 .0 000000 NO CROWDER. CHARLES H. 397715 C 1336 11.057 D 0 133218 3 C 64 210 N COOODS NO HERBECK . HOWARD 398928 C 1336 67 11 057 1 4 133218 210 N 0 C 000000 NO BHUINSHA, THYS 400476 C 1336 11 057 4 1 133218 67 210 N 0 C 000000 10 NO KOJIS, GEORGE 406371 E 1336 D 11 057 1 4 133218 000000 3 84 210 N 0 0 N O WHITMAN, JERRY 11 057 0 0 133218 332778 E 1627 'n 54 115 U.C. C 000000 NO B RUSH 336258 E 1094 D 11 057 0 0 133218 105 GR 000000 183 Ω NO HOWARD J 439683 I 1477 11 057 4 2 133218 63 200 0 C 18 0023 NO DRIGGERS, MARGARET 475 153 T 1336 11 957 9 0 133218 84 220 r c 5 NO 0000 DANIELS. DAVID 5.E.E.6 499395 I 2088 185 O C 0000 11 057 0 0 133218 39 O N O NETTGEN. ELMER 503174 1 1477 11 057 4 4 133218 GIBSON, W. W. 433885 1 2858 0 11 057 1 4 133218 0000 NO PAYLESS OIL 12 N O A 433886 I 2858 11 057 1 4 133218 12. N O A PAYLESS DIL 0000 NO 433887 I 2858 11 057 1 4 133218 12 N R A 0000 NO PAYLESS OIL 11 057 1 4 133218 433888 I 2858 O A 0 12 N PAYLESS OIL 0000 NO 444245 I 2587 11 057 0 0 133218 12 Ω A 0000 NO HANDY FOOD STORES 11 057 0 0 133218 12 3 A 0000 444246 I 2587 N O HANDY FOOD STORES 12 444247 I 2587 11 057 0 0 133218 DA 0000 HANDY FOOD STORES NO 444248 I 2587 ۵ 11 057 0 0 133218 2 12 D A 0000 NO HANDY FOOD STORES 332091 E 1477 000000 11 057 0 0 143218 63 571 DC NO RAINBOW FLO 442683 I 1336 CONSTANTINE TRUST, T. J. 11 057 3 1 143218 55 525 N 0 C 20 0000 NO. 000000 383721 C 1057 A 11 057 4 4 143218 8 63 325 N O C NO ELSBERRY BROTHERS INC. 406419 E 2088 11 057 0 0 143218 8.0 786 Y 000000 NO. CARLTON, C DENNIS 420163 I 1336 B 11 057 0 0 143218 70 200 Y 6 C 0000 RAINBOW FLOWERS INC. NO 339076 H 1477 B 11 057 0 0 143218 63 201 Y 2 C 000000 N O RAINBOW FLW 6 308998 E 0000 D 130 P HOSS 11 057 0 0 143218 3 40 n c 000000 NO

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DATE 9/27/90 5:02:12 SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT PAGE WELL CONSTRUCTION PERMITTING RDB0055 PERMIT SUMMARY FROM: 00/00/00 TO 99/99/99 BY: COUNTY: BASIN: 5:13 - 36 T:32 R:18 DEPTH: 0 TO 9999 DIAMETER: 0 TO 99 METHOD: USE: CASE DEPTH: SWL TAE D BT ATV I T DRILL U R ONAH TEE U LICN 5 I T LOCATION I CASE WELL U BG O IRL A 0 0 L PERMIT S NUMBER E 000 S T R A DEPH DEPH T RS D PP N F USER-ID LOT OWNER NAME 434980 I 1232 E 11 057 0 0 193218 40 125 Y 15 R 0000 **MESA CORROSION** 349082 N 1509 0 11 057 0 0 213218 *** CANCELLED *** CLAPROOD, VICTOR 11 057 0 0 223218 75 240 Y 5 C 338908 H 1336 В 000000 NO HW IL MB PK 473352 I 9028 0 11 057 0 0 223218 25 Y 1 A 0000 TODD. GEORGE K.SR. NO 473353 I 9C28 11 057 0 0 223218 25 Y 1 A 0 ū 0000 NO. TODD, GEORGE K.SR. 473355 I 9£28 0 11 057 0 0 223218 25 Y 1 A 0000 NO TODD, GEORGE K.SR. 473356 I 9028 0 11 057 0 0 223218 ñ 25 Y 1 A 0000 NO TODD, GEORGE K.SR. 473357 I 9028 0 11 057 0 0 223218 25 Y 1 A 0 0000 TODD, GEORGE K.SR. ND 473358 I 9028 0 11 057 0 0 223218 25 Y 1 A 0000 NO TODD. GEORGE K.SR. 473359 N 9028 11 057 0 0 223218 2 *** CANCELLED *** 0 TODD, GEORGE K.SR. 473360 N 9028 0 11 057 0 0 223218 2 *** CANCELLED *** TODD, GEORGE K.SR. 349983 N 1509 0 11 057 0 0 223218 6 *** CANCELLED *** CLAPROOD. VICTOR 349084 N 15C9 11 057 0 0 223218 8 *** CANCELLED *** CLAPROOD, VICTOR 413661 E 2502 11 057 0 0 223218 11-207 Y 26 183 DR NO WILDER CORPORATION OF DELAWARE 458905 I 2088 11 057 0 0 233218 320 0 C D 0000 TODD, GEORGE 63 NO 310333 E CCOU 11 057 1 3 233218 8 159 625 0 000000 NO LIESY TODD 225 N D C 323268 H 1336 B 11 057 2 4 233218 8.0 25 000000 NO G TINDALE SPEEDLINE 337776 H 1160 11 057 0 0 233218 8.0 267 Y 9 C 000000 NO 353451 C 1094 11 057 0 0 233218 2 189 242 OR 28 000000 NO YORK, C. 362923 C 1094 D 11 057 0 0 233218 2 126 301 CR ۵ 000000 NO SARNER. MARCUS L. 370069 C 1094 D 11 057 0 0 233218 107 253 G P 14 000000 NO HOBART, RENÀ 375122 C 2250 D 11 057 0 0 233218 2 109 232 Y LOT-24 NO RODRIGUEZ, MR. 375162 N 2250 п 11 057 0 0 233218 2 *** CANCELLED *** FOSTER. JOHN BLANCHARD 376395 C 2250 16 057 0 0 233218 2 106 LOT-18 NO. 377087 C 2250 14 057 0 0 233218 2 108 240 Y 6 R LOT-13 NO CHRISTIE. GREG 378401 C 2250 LOT-12 BABBITT, IVAN D 11 057 0 0 233218 2 109 232 Y 5 R 0 NO 378888 C 2250 D 11 057 0 0 233218 110 242 Y LOT-17 NO SYNDER, ROBERT 379159 C 2250 TOWER ח 11 057 0 0 233218 2 110 258 Y LOT-20 NO 380246 C 2250 11 057 0 0 233218 a LOT-22 BETTY, MR. D 2 111 262 Y NO. 218 Y 5 R 386247 C 2250 11 057 0 0 233218 2 108 LOT-18 NO FORD. HR. LOT-10 380248 C 2250 11 057 0 0 233218 2 107 232 Y NO NORELSKI. MR. LOT-2D 380323 C 2250 11 057 0 0 233218 2 208 238 Y 15 R 0 NO ROCHON. CONRAD D 383519 C 2251 000 STEINBANG, GERALD D 11 057 0 0 233218 2 130 232 N NO 388162 C 2251 D 11 057 0 0 233218 232 Y 5 R LOT 14 NO. GAMBRELL, HERMAN H. 2 112 388469 C 2251 11 057 0 0 233218 2 165 232 Y 5 R LOT 17 N O MACKENZIE, THERESA THARP, JOHN W 393244 C 225ú 11 057 0 0 233218 123 292 Y LOT 22 NO. 0000 NIXON. PRISCILLA 432318 I 1336 D 11 057 2 3 233218 90 125 0 0 15 N O HOBART, RENA 000000 372431 C 1094 D 11 057 9 0 233218 4 100 235 0 R 17 NO 372517 C 1094 D 11 057 O 0 233218 4 101 243 0 R LOT-25 BLANCHARD

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378223 C 208				247 N		7		00000		NO_	TODD JR., GEORGE		
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381583 C 225				225 Y		Ç		LOT-10		NO	MOOREHOUSE		
381584 C 225				232 Y		0		LOT-15		NO	LUCAS		
381894 C 225				222 Y		0		LOT-13		NO	DANIEL, CHARLENE		
393875 C 225				222 Y		0 .		LOT 17	·····	NO_	SANTANA, C		
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386212 C 1336 D 11 057 2 4 243218 3 90 220 N 0 C 0 000000 NO COMBS, HELEN F.	
389662 C 1336 D 11 057 0 0 243218 3 92 216 N 0 C 22 000000 NO BEATTIE, MARVIN	
389663 C 1336 D 11 057 D 0 243218 3 74 230 N D C 22 D00000 NO BOYLER, EDWARD	
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378648 E 1477 D 11 057 0 0 243218 4 96 200 N 0 C 0 LOTB&C NO LARGE, FRANK	
382852 C 2C88 D 11 057 0 0 243218 4 67 250 N 0 C 18 000000 NO THOMAS, PAUL	
384713 E 1477 D 11 057 4 2 243218 4 96 220 N D C G LOT-14 NO KLINGENSHITH, RLAPH L.	
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388488 C 2088 D 11 057 D 0 243218 4 68 240 N 0 C 13 000000 NO GOMEZ, FRANK 388752 C 2088 D 11 057 D 0 243218 4 78 205 N 0 C 10 000000 NO SMITH, ED A	
388753 C 2088 D 11 057 D 0 243218 4 83 200 N D C 5 000000 NO SHITH, ED A	
389270 C 2088 D 11 057 0 0 243218 4 74 200 N 0 C 16 000000 NO SMITH. ED A	
397110 C 2088 D 11 057 0 0 243218 4 83 203 N O C 0 000000 NO CAVAZOS, PEDRO	
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409590 E 1477 D 11 057 0 0 243218 4 66 220 N 0 C 0 L10611 NO MARSELL, GERALD A C CAF	
409591 E 1477 D 11 057 0 0 243218 4 98 250 N O C O LOT 23 NO MARSELL, GERALD A & CAF	
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GROUND WATER GUIDANCE CONCENTRATIONS

FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
Division of Water Facilities

Bureau of Ground Water Protection Compiled by: Randy Merchant February 1989

INTRODUCTION

A table of ground water guidance concentrations was distributed to all DER District Offices October 2, 1986 to provide guidance to District personnel in reviewing effluent and ground water quality data for Minimum Criteria requirements (Rule 17-3.402, F.A.C.). This booklet, Ground Water Guidance Concentrations is an update of that 1986 table, incorporating toxicological data that has become available since then. This updated version has the same purpose and format of the original table and should be used in its place.

Three significant sources of toxicological information have become available since the table was originally compiled in 1986: 50 pesticide Health Advisories from the EPA Office of Drinking Water, 45 Recommended Protective Concentrations (RPCs) proposed by the Center for Biomedical and Toxicological Research (CBTR) at Florida State University, and 26 new EPA proposed Maximum Contaminant Levels (MCLs). These three sources account for the majority of the new entries and updates to this booklet. The Appendix to this booklet elaborates on the procedures and priorities used to compile these sources. The resulting Guidance Concentrations were compared to other state guidelines and standards and were reviewed by Florida and EPA toxicologists.

The concentrations in this booklet are not standards and without adoption by the Environmental Regulation Commission can not be used as standards. These guidelines should be used to screen analytical chemical results so that concentrations above the Guidance Concentration will be given closer scrutiny. In permitting or enforcement cases an expert may be needed to verify the carcinogenicity or other human health hazards of contaminants above the Guidance Concentration. This booklet has been compiled from published research on human health risks from the direct consumption of ground water. These concentrations, however, may be modified in the future as new research becomes available and feedback is received.

The concentrations in this booklet are designed to apply to ground water only and should not be used for surface water applications. In cases where a significant ground water discharge to surface water is anticipated, a lower Guidance Concentration may be necessary due to the additional human exposure via consumption of contaminated fish and other aquatic organisms. A lower ground water Guidance Concentration may also be necessary to protect fish and aquatic organisms from direct toxic effects of a ground water to surface water discharge.

These ground water Guidance Concentrations are based on health effects and are not designed to be used as ground water clean-up goals, which may consider additional factors such as feasibility, existing technology, and costs. In some cases it may not feasible to remediate ground water to low level, health based concentrations.

The column "Detection Limit" in the original table has been modified to read "Practical Quantitation Level" in this booklet. This change more closely reflects the original intent to provide an estimate of the lowest concentration routinely quantifiable by most analytical laboratories. The concentrations under "Detection Limit"

in the original table were in some cases overly optimistic and were not obtainable on a routine basis. The Appendix to this booklet details the derivation of the Practical Quantitation Levels.

The Bureau of Ground Water Protection, UIC Criteria & Standards Section is prepared to assist in the interpretation and application of this information. Questions regarding this <u>Ground Water Guidance Concentrations</u> booklet should be directed to either Jim McNeal or Randy Merchant (904 488-3601, SC 278-3601).

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION GROUND WATER GUIDANCE CONCENTRATIONS* FEBRUARY 1989

9 A9 Practical Practical Guidance* Quantitation Concentration Level CAS # Parameter (ug/ L) (ug/L) Basis/Comment 20 83-32-9 Acenaphthene 10 Organoleptic (AWQCD) 208-96-8 10 10 PQL Acenaphthylene 700 5-10 A IRIS 67-64-1 Acetone $PQL / lug/L = 10^{-6}$ 5094-66-6 10 5-10 A Acifluorfen (Blazer) cancer risk (H.A.) 107-02-8 Acrolein (Propenal) 110 5 EPA PPCL $PQL / 0.01ug/L=10^{-6}$ 79-06-1 1 Acrylamide 1 (2-Propeneamide) cancer risk (CAG) PQL / 0.063ug/L=10⁻⁶ 2.5 107-13-1 2.5 Acrylonitrile cancer risk (AWQCD) 15972-60-8 Alachlor 1.5 Lifetime Health Adv. 5 116-06-3 Aldicarb (Temik) 10 Lifetime Health Adv. 5 Aldicarb sulfoxide Lifetime Health Adv. 10 1646-88-4 40 ** Aldicarb sulfone 5 Lifetime Health Adv. 0.05 309-00-2 Aldrin 0.05 PQL / RPC= 0.013 ug/ L Alpha, gross **** 15 pCi/ L Primary D.W. Standard 834-12-8 Ametryn 5-10 A Lifetime Health Adv. 60 5-10 X 7773-06-0 Ammonium sulfamate 2,000 Lifetime Health Adv. 120-12-7 10 POL Anthracene 10 29 20 7440-36-0 Antimony EPA PPCL (ADI) Arsenic **** 50 Primary D.W. Standard 1332-21-4 Asbestos *** 0.1 million 7 million Proposed EPA MCL fibers/L fibers/L 1912-24-9 Atrazine 0.25 Lifetime Health Adv. Barium **** 1,000 500 Primary D.W. Standard PQL / 3ug/ L=Lifetime 114-26-1 10 5-10 A Baygon Health Advisory (Propoxur) 25057-89-0 20 5-10 A Bentazon Lifetime Health Adv. Benzene **** 71-43-2 1 1 Primary D.W. Standard Benzenehexachloride (See Hexachlorocyclohexane) $PQL / 0.00015ug/L=10^{-6}$ 92-87-5 10 Benzidine 10 cancer risk (AWQCD) 10 10 56-55-3 Benzo(a)anthracene PQL 10 10 POL 205-99-2 Benzo(b)fluoranthene 207-08-9 Benzo(k)fluoranthene 10 10 PQL

^{*}The concentrations in this table are only to be used as a screening guideline for ground water contamination. These concentrations are not standards and without further justification can not be used as standards.

Practical
Guidance* Quantitation

	Concentration Level				
CAS #	Parameter	(ug/ L)		Basis/ Comment	
191-24-2 50-32-8	Benzo(g,h,i)perylene Benzo(a)pyrene	10 10 ;	10 10	PQL / 0.003ug/ L=10 ⁻⁶	
7440-41-7	Beryllium	5	5	cancer risk (AWQCD) ₆ PQL / 0.004ug/ L=10 cancer risk (AWQCD)	
·	BHC (See Hexachloro- cyclohexane)			Carren Vinder,	
92-52-4	Biphenyl	10	5-10 A	PQL / 0.5ug/ L = organoleptic (RPC)	
314-40-9	Bromacil	90	10	Lifetime Health Adv.	
75-27-4	Bromodichloromethane (See Trihalomethane			Type me near many	
75-25-2	Bromoform (See Trihalomethan)	e)			
74-83-9	Bromomethane (Methyl bromide)	20	10	RPC	
101-55-3		10	10	PQL	
78-93-3					
123-86-4		43	5-10 X	Organoleptic (RPC)	
2008-41-5		700	5-10 A	Lifetime Health Adv.	
85-68-7	Butyl benzyl	1,400	10	IRIS	
00 00 /	phthalate	.,	10	11/15	
85-70-1	Butyl phthalyl	120,000	5-10 A	Water solubility limit	
05 / 0 1	butyl glycolate	120,000	3 10 A	(AWQCD ADI=350,000ug/L)	
	Cadmium ****	10	10	Primary D.W. Standard	
63-25-2		700	5	Lifetime Health Adv.	
1563-66-2		36	5	Lifetime Health Adv.	
108-95-2	Carbolic acid		•		
	(See Phenol)				
56-23-5	Carbon tetrachloride (Tetrachloromethane		1	Primary D.W. Standard	
5234-68-4	Carboxin	700	5-10 A	Lifetime Health Adv.	
133-90-4	Chloramben	100	5-10 A	Lifetime Health Adv.6	
57-74-9	Chlordane	0.1	0,1	PQL / 0.027 ug/ L=10 ⁻⁶	
		1.0 hph		cancer risk (H.A.)	
	Chloride ****	250,000	1000	Secondary D.W. Std.	
108-90-7	Chlorobenzene	10	1	Organoleptic (H.A.)	
124-48-1	Chlorodibromomethane			· •	
	(See Trihalomethane))			

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Practical
Guidance* Quantitation

	Concentration Level				
CAS #	Parameter	(ug/ L)		Basis Comment	
78-59-1	Isoacetophorone (See Isophorone)		,		
78-59-1		1,050 #	10	AWQCD (ADI)	
98-82-8	Isopropyl benzene	10	5-10 A	PQL / 0.8ug/ L =	
70 02 0	(Cumene)	.0	J 10 h	organoleptic (RPC)	
	Lead ****	50	50	Primary D.W. Standard	
58-89-9	Lindane ****	4	0.05	Primary D.W. Standard	
330-55-2		22	0.05	RPC	
123-33-1		4,000	5-10X	Lifetime Health Adv.	
12327-38-2		75	75	PQL / 14 ug/ L = RPC	
	Manganese ****	50	25	Secondary D.W. Std.	
94-74-6	•	1,000	1,000 A	PQL / 4 ug/ L=	
	methylphenoxy			Lifetime Health Adv.	
	acetic acid)	2		6.4	
10265-92-6	Mercury ****	2	0.2	Primary D.W. Standard	
16752-77-5	Methamidophos Methomyl	18 200	5-10 X 50	RPC	
72-43-5	Methoxychlor ****	100	0.5	Lifetime Health Adv. Primary D.W. Standard	
74-83-9	Methyl bromide	100	0.5	rrilliary U.W. Stalldard	
7 + 05 5	(See Bromomethane)				
74-87-3	Methyl chloride				
	(See Chloromethane)				
534-52-1	2-Methyl-4,6-dinitro-				
	phenol (See 4,6-Di-				
	nitro- <u>o</u> -cresol)			-6	
75-09-2		5	1	10 ⁻⁶ cancer risk	
70 02 2	(Dichloromethane)	170 "		(Health Advisory)	
78 - 93-3	Methyl ethyl ketone	170 #	10	Lifetime Health Adv.	
60-34-4	(MEK, 2-Butanone) Methyl hydrazine	10	5-10 A	PQL / 0.03ug/ L=10 ⁻⁶	
00-34-4	Methyl Hydrazine	10	2-10 X	cancer risk (EPA PPCL)	
108-10-1	Methyl isobutyl keton		5	IRIS	
200-00-0	(4-Methyl-2-pentanon		E 10 A	001 / 200/10	
298-00-0	Methyl parathion	10	5-10 A	PQL / 2ug/L= Lifetime Health Adv.	
51218-45-2	Metolachlor	100	5-10 A	Lifetime Health Adv.	
21087-64-9	Metribuzin	200	2	Lifetime Health Adv.	
2385-85-5	Mirex	3.5	0.1	RPC	
91-20-3	Napthalene	10	10	PQL ' 6.8ug/ L =	
				organoleptic (RPC)	
7440-02-0	Nickel	150	50	Lifetime Health Adv.	
	Nitrate (as N) ****	10,000	5	Primary D.W. Standard	
	Nitrite (as N)	1,000	100	Health Advisory	

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GROUND WATER GUIDANCE CONCENTRATIONS

FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
Division of Water Facilities

Bureau of Ground Water Protection Compiled by: Randy Merchant February 1989

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION GROUND WATER GUIDANCE CONCENTRATIONS* FEBRUARY 1989

66 P Practical Guidance* Quantitation Concentration Level CAS # Parameter (ug/L)(ug/L) Basis/ Comment 83-32-9 20 10 Acenaphthene Organoleptic (AWQCD) 208-96-8 Acenaphthylene 10 10 PQL 67-64-1 700 5-10 A Acetone IRIS $PQL / lug/L = 10^{-6}$ 5094-66-6 10 5-10 A Acifluorfen (Blazer) cancer risk (H.A.) 107-02-8 Acrolein (Propenal) 110 5 EPA PPCL PQL / 0.01ug/ L=10⁻⁰ 79-06-1 1 Acrylamide 1 (2-Propeneamide) cancer risk (CAG) PQL / 0.063ug/L=10⁻⁶ 107-13-1 Acrylonitrile 2.5 cancer risk (AWQCD) 15972-60-8 1 Alachlor 1.5 Lifetime Health Adv. 116-06-3 Aldicarb (Temik) 10 5 Lifetime Health Adv. 5 Aldicarb sulfoxide 10 Lifetime Health Adv. 40 ** 1646-88-4 Aldicarb sulfone Lifetime Health Adv. 0.05 309-00-2 0.05 PQL / RPC= 0.013 ug/ L Aldrin Alpha, gross **** 15 pCi/L Primary D.W. Standard 834-12-8 Ametryn 60 5-10 A Lifetime Health Adv. 2,000 5-10 X 7773-06-0 Lifetime Health Adv. Ammonium sulfamate 120-12-7 10 Anthracene 10 PQL **Antimony** 29 20 7440-36-0 EPA PPCL (ADI) Arsenic **** Primary D.W. Standard 50 5 1332-21-4 Asbestos *** 7 million 0.1 million Proposed EPA MCL fibers/L fibers/ L 1912-24-9 Atrazine 0.25 Lifetime Health Adv. 1,000 Barium **** 500 Primary D.W. Standard 5-10 A 114-26-1 10 PQL / 3ug/ L=Lifetime Baygon (Propoxur) Health Advisory 25057-89-0 20 5-10 A Bentazon Lifetime Health Adv. Benzene **** 71-43-2 1 Primary D.W. Standard Benzenehexachloride (See Hexachlorocyclohexane) $PQL / 0.00015ug/L=10^{-6}$ 92-87-5 Benzidine 10 10 cancer risk (AWQCD) 56-55-3 Benzo (a) anthracene 10 10 PQL Benzo (b) fluoranthene 10 10 PQL 205-99-2 POL 10 10 207-08-9 Benzo(k)fluoranthene

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Practical
Guidance* Quantitation

		Concentration	Level	
CAS #	<u>Parameter</u>	<u>(ug/ L)</u>	(ug/ L)	Basis Comment
107-02-8	Propenal (See Acrolein)			
76-06-1				
122-42-9	Propham	100	5-10 A	Lifetime Health Adv.
129-00-0	Pyrene	10	10	PQL
	Radium-226+228 ****	5 pCi/L		Primary D.W. Standard
•	Selenium ****	10	5	Primary D.W. Standard
	Silver ****	50	50	Primary D.W. Standard
93-72-1		*** 10	1	Primary D.W. Standard
122-34-9	Simazine	10	5-10 A	PQL / 4ug/ L=Lifetime H.A.
	Sodium ****	160,000	500	Primary D.W. Standard
100-42-5	Styrene (Vinyl benze	ene) 1	1	PQL / 0.01 ug/L=10 ⁻⁰
				cancer risk (H.A.)
	Sulfate ****	250,000	500	Secondary D.W. Std.
93-76-5				
	Trichlorophenoxy-			
	acetic acid)			
	TDS (Total ****	500,000		Secondary D.W. Std.
	_ Dissolved Solids)			
34014-18-1		500	5-10 A	Lifetime Health Adv.
116-06-3				
5902-51-2		90	5-10 A	Lifetime Health Adv.
13071-79-9	Terbufos	10	5-10 A	PQL / 0.9 ug/L=
				Lifetime Health Adv.
95-94-3	1,2,4,5-Tetrachloro-	• 35	10	EPA PPCL (ADI)
	benzene			· · · · · -7 · · ·
1746-01-6	2,3,7,8-Tetrachloro-	0.01	0.01	PQL ₆ / 2.2 X 10 ⁻⁷ ug/ L=
	dibenzo-p-dioxin			in caucer Lizk
70 34 5	(TCDD, Dioxin)	•	•	(Health Advisory)
79-34-5	1,1,2,2-Tetra-	1	1	PQL / 0.8 ug/ L = RPC
107 10 4	chloroethane	**** 3	•	Defense D. U. Standard
127-18-4		-	1	Primary D.W. Standard
56 22 E	(Perchloroethylene	:, :*** 3	•	Defense D. H. Standard
56-23-5	Tetrachloromethane 1 (Carbon-	3	1	Primary D.W. Standard
	tetrachloride)			
7440-28-0		10	10	PQL / 3.7ug/ L=EPA PPCL
108-88-3		24	10	Organoleptic (RPC)_6
636-21-5	o-Toluidine	10	5-10 X	PQL / 0.146ug/ L=10-6
000-51-0	hydrochloride	10	3 10 X	cancer risk (EPA PPCL)
	Total Dissolved ***	500.000		Secondary D.W. Std.
	Solids (TDS)	,		ccconder y contrader
8001-35-2	Toxaphene ****	5	1	Primary D.W. Standard
	· audinana	•	-	J m

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DEVELOPMENT OF REGIONAL IMPACT APPLICATION FOR DEVELOPMENT APPROVAL

FOR
IMC FERTILIZER, INC.
NEW WALES GYPSUM STACK EXPANSION
POLK COUNTY, FLORIDA

stack can be used to project these parameters for the proposed stack expansion.

In this regard, samples of phosphogypsum were collected and analyzed for radium-226 to help characterize the potential for its release to the environment from the phosphogypsum stack. Radon flux measurements were taken to measure radon emissions from the stack. Ambient concentrations of radon in air, working levels, and radium-226 in suspended particulate matter were measured to estimate concentrations of radioactivity in the environment surrounding the New Wales facility. In addition, atmospheric dispersion modeling techniques were used to estimate ambient concentrations of radon expressed in working levels.

The results of the assessment indicate that existing levels of radioactivity in air in the vicinity surrounding the New Wales facility are well below radiation protection criteria. In addition, projections of future levels of environmental radioactivity indicate that increases which may occur as a result of the phosphogypsum stack expansion will be minimal. The following sections describe the procedures used to conduct the assessment and the results obtained.

ENVIRONMENTAL RADIATION CRITERIA

No specific standards have been adopted which relate to airborne emissions of radium-226 and radon-222 from

IMCF New Wales Gypsum Stack Expansion DRI Question 13.A.

phosphogypsum stacks. That is, standards for radon or radium in ambient air or radium in soils have not been promulgated. However, some criteria do exist which can be used for comparative purposes.

The State of Florida maximum permissible concentration (MPC) for radium-226 in air is 2 x 10⁻¹² microcuries per milliliter or two picocuries per cubic meter (Florida Administrative Code, Chapter 10 D-91). This MPC is not an ambient air quality standard but refers to releases of radioactive materials by holders of Radioactive Materials Licenses. While no specific criteria exist for radium deposition, the National Council on Radiation Protection and Measurements has recommended a guide of picocuries of radium-226 per gran account as a concentration to be evaluated for agricultural land use (NCRP 1984).

With respect to radon-222 progeny, the State of Florida has adopted an indoor standard of 0.02 working levels (WL) for new construction (Florida Administrative Code, Chapter 10 D-91). For the purposes of comparing radon concentrations in air to this radon progeny standard, a concentration of 4 picocuries of radon in one liter of air is considered to be equivalent to 0.02 WL.

U.S. EPA REGION IV

SDMS

Unscannable Material Target Sheet

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1927 LAKESIDE PARKWAY SUITE 614 TUCKER, GEORGIA 30084 404-938-7710

C-586-9-0-206

September 25, 1990

Mr. William Bokey Environmental Protection Agency College Station Road Athens, Georgia 30613

Subject:

Screening Site Inspection, Phase II

Study Plan

AMAX Phosphate

marcee- Dordon

Palmetto, Manatee County, Florida

EPA ID No. FLD043055151 TDD No. F4-9009-01

Dear Mr. Hanke:

Enclosed please find two copies of the Study Plan, Revision 0, for the Screening Site Inspection to be conducted at AMAX Phosphate, Palmetto, Manatee County, Florida. Field work is scheduled for the week of October 15, 1990.

If you have any comments, please do not he sitate to contact me.

Very truly yours,

Approved:

Maureen Gordon, Ph.D.

Project Manager

MG/jec

Enclosures (2)

SEPT 7 , or

SEP 28 1990

STUDY PLAN SCREENING SITE INSPECTION, PHASE II AMAX PHOSPHATE PALMETTO, MANATEE COUNTY, FLORIDA EPA ID #: FLD043055151

SISB/SAS DECEMBER SEP 29 1990 EPA-REGION IV ATLANTA, GA

Prepared Under TDD No. F4-9009-01 CONTRACT NO. 68-01-7346

Revision 0

FOR THE

WASTE MANAGEMENT DIVISION U.S. ENVIRONMENTAL PROTECTION AGENCY

SEPTEMBER 25, 1990

NUS CORPORATION SUPERFUND DIVISION

Prepared By

Reviewed By

Approved By

Maureen M. Gordon, Ph.D.

Project Manager

Roger Franklin

Assistant Regional

Project Manager

Regional Project Manager

NOTICE

The information in this document has been funded wholly by the United States Environmental Protection Agency (EPA) under Contract Number 68-01-7346 and is considered proprietary to the EPA.

This information is not to be released to third parties without the expressed or written consent of the EPA.

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STUDY PLAN

SCREENING SITE INSPECTION, PHASE II

AMAX PHOSPHATE

PALMETTO, MANATEE COUNTY, FLORIDA

EPA ID #FLD043055151

TDD NO. F4-9009-01

1.0 INTRODUCTION

The NUS Corporation Region 4 Field Investigation Team (FIT) has been tasked by the U.S. Environmental Protection Agency (EPA), Waste Management Division to conduct a Screening Site Inspection (SSI) at the AMAX Phosphate facility in Manatee County, Florida. The inspection will be performed under the authority of the Comprehensive Environmental Response Compensation and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA). Tasks will be performed to satisfy the requirements stated in Phase II of Technical Directive Document (TDD) number F4-9009-01.

1.1 Objectives

The objectives of this Phase II inspection will be to determine the nature of contaminants present at the site and to determine if a release of these substances has occurred or may occur. Further, this inspection will seek to determine the possible pathways by which contamination could migrate from the site and the populations and environments it would potentially affect. Through these objectives, a recommendation will be made regarding future activities at the site.

Specific elements are:

- Obtain information to prepare a site-specific preliminary HRS
- Provide EPA the necessary information to make decisions on any other actions warranted at the site.

1.2 Scope of Work

The scope of this investigation will include the following activities:

- Obtain and review background materials relevant to HRS scoring of site
- Obtain aerial photographs and maps of site, if possible
- Obtain information on local water systems
- Evaluate target populations associated with the groundwater, surface water, air and onsite exposure pathways
- Conduct a survey of private wells
- Determine location and distance to nearest potable well
- Develop a site sketch
- Collect environmental samples

1.3 <u>Schedule</u>

Week of October 15, 1990

1.4 Personnel

Project Manager - Maureen Gordon Other personnel as required

1.5 <u>Permits and Authorization Requirements</u>

EPA is responsible for obtaining access to the site and permission to take photographs of site. In addition, EPA is responsible for all permits which may be required to accomplish this task.

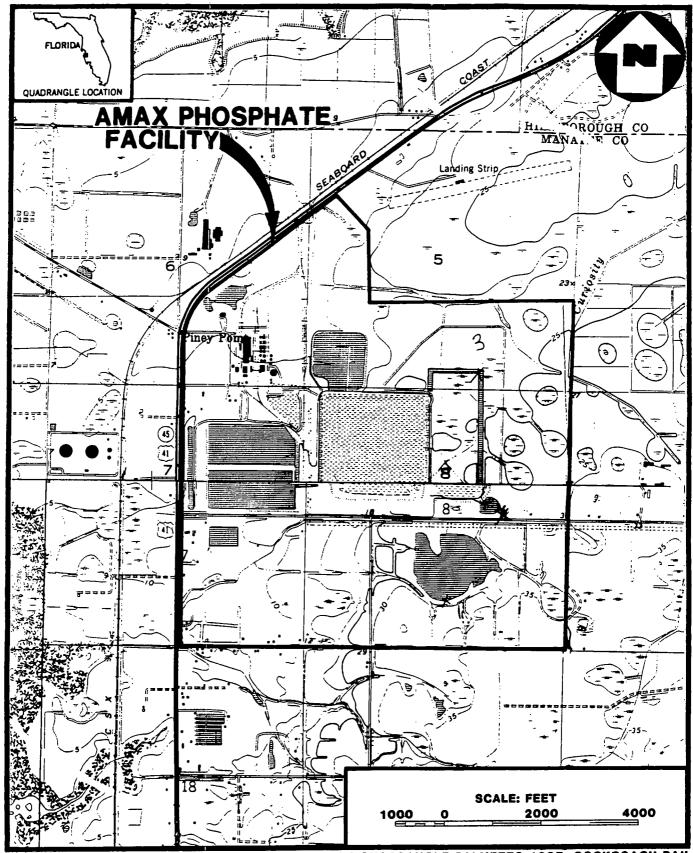
1.6 Site History and Description

The AMAX Phosphate Facility, Piney Point Complex, is located in the northwest section of Manatee County, approximately 0.25 mile inland from Tampa Bay (Refs. 1, 2). The facility was previously owned by the Consolidated Minerals, Inc.; however, it was purchased by Royster sometime in 1988 (Ref. 3). The facility includes sulfuric acid plants, phosphoric acid plants, ammoniated fertilizer plants and gypsum stack/cooling pond complex on approximately 300 acres. Operations began at the facility in 1966 and expanded in 1978 (Ref. 4). A site location map appears on Figure 1 and a site layout map on Figure 2.

After extracting phosphate from ore, gypsum (hydrated calcium sulfate) is produced as a byproduct. It is pumped as a slurry with plant process water to the tops of gypsum stacks for disposal. This process water is characterized as having a very low pH and high concentrations of arsenic, cadium, chromium, lead, sodium, fluoride, manganese, iron, sulfate and total dissolved solids (TDS). High levels of radioactive particle emissions are also typical for the plant process water (Ref. 4).

In addition to calcium sulfate, the process water includes scrubber water from the phosphoric acid and diammonium phosphate plants. This stream is ponded and when possible recycled. Contaminated non-process water, on the other hand, is discharged through two NPDES discharge systems (001, 002). Process water which is not recirculated is treated with lime and discharged through a third outfall (003) (Ref. 5).

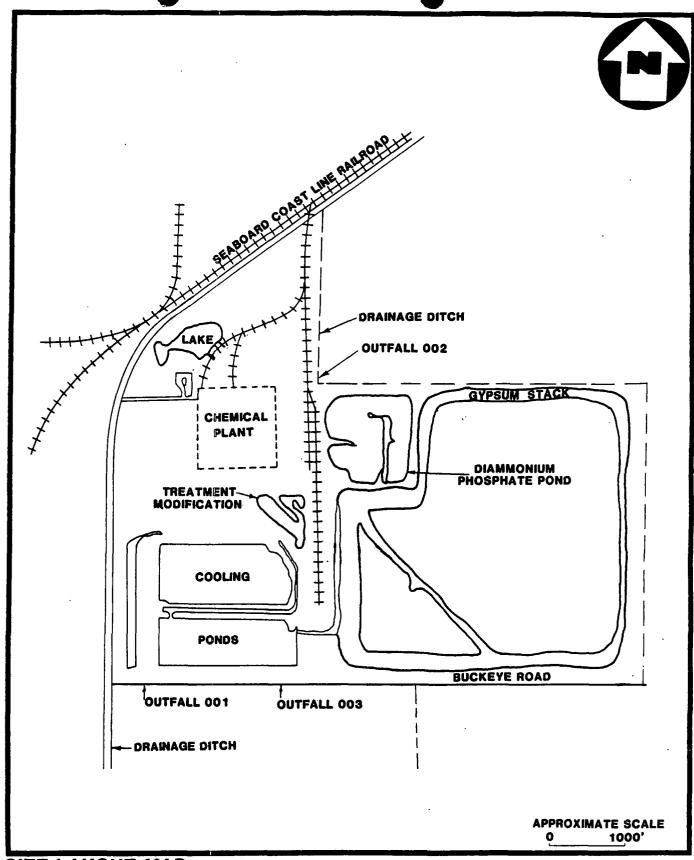
All gypsum stack/cooling pond facilities routinely monitor groundwater quality according to approved plans. In September 1983 a groundwater monitoring plan was approved by the Department of Environmental Regulation. This was issued and withdrawn in 1985; then, a second permit was issued in March 1987. The following elevated analyses indicate groundwater quality problems in the surficial aquifer at the AMAX facility: sodium, sulfate, total dissolved solids (TDS), manganese and iron (Ref. 4).



BASE MAP IS A PORTION OF THE U.S.G.S. 7.5 MINUTE QUADRANGLE PALMETTO 1987, COCKROACH BAY 1981, FLORIDA.

SITE LOCATION MAP AMAX PHOSPHATE PALMETTO, MANATEE COUNTY, FLORIDA





SITE LAYOUT MAP AMAX PHOSPHATE PALMETTO, MANATEE COUNTY, FLORIDA



1.7 Regional Hydrogeology

AMAX Phosphate Facility is located in the Atlantic (Gulf) Coastal Plain hydrogeologic regime consisting of complexly interbedded sand, silt, and clay layers which dip toward the coast (Ref. 6). Karst topography is present within the site locale (Ref. 7). The aquifer normally used in this area is the Floridan aquifer located at a depth of 100-200 feet below land surface (bls) (Ref. 7). The clay sediments of the overlying Hawthorn Formation represent the layer of lowest hydraulic conductivity between the Floridan aquifer and land surface. Local soils have been shown to have a hydraulic conductivity in the 1x10-5 to 1x10-7 range (Ref. 8). The net annual rainfall for this area is 4 inches (Ref. 9). The 1-year, 24-hour rainfall is 4 inches (Ref. 10).

Manatee County supplies many of the residents in the vicinity of the site with potable water from Lake Manatee located approximately 30 miles southeast of the site (Ref. 11). Topographic maps were used to determine the number of private wells within a 4-mile radius of the facility. Approximately 156 private wells were identified within a 3-mile radius of the facility and an additional 20 between the 3- to 4-mile radii (Ref. 2). Also, there are many irrigation wells in the site vicinity used for the many lime, orange, and grapefruit groves. There is a private well on the facility and the nearest offsite well is located approximately 500 feet east of the AMAX gypsum disposal area. The total depth of this well is 600 feet bls; however, the well casing only extends to a depth of 70 to 80 feet (Ref. 11).

As previously mentioned, the facility has three surface water outfalls (Ref. 1). Contaminated, non-process wastewater is discharged through outfalls 001 and 002; nonrecyclable process water is treated and discharged through outfall 003. Outfalls 001 and 003 discharge into Buckeye Road drainage ditch, which flows southward to Bishop Harbor; outfall 002 discharges into Piney Point Creek (Refs. 2). A man-made canal system is used to transport the effluent from the NPDES-permitted outfalls 001 and 002 to Bishop Harbor. However, this waterway is also used to drain runoff from Buckeye Road, U.S. Highway 41, the railroad lines and agriculture fields (Ref. 1).

2.0 SAMPLING INVESTIGATION

The sampling investigation will include the collection of sediment, surface soil, subsurface, surface water and groundwater samples from background and onsite locations. The nearest potable well to the site will also be sampled in addition to an on site well. All sampling locations are tentative. All samples will be analyzed for extractable and purgeable organic compounds, pesticides, PCBs, cyanides and metals. Selected samples will also be analyzed for radium 226/228 and Gross alpha.

Analyses for the organic and inorganic constituents will be performed under the Contract Laboratory Program (CLP), while the radiation samples will be analyzed by the EPA radiation laboratory in Montgomery, Alabama.

2.1 Surface Soil and Gypsum Sampling

Seven surface soil samples will be collected. Four samples will be collected from areas near potential sources of contamination. Two offsite samples will be used to establish background conditions. Additionally,, one gypsum sample will be taken from the gypsum stacks. Analyses for radium 226/228 and gross alpha will be performed on one sample collected from each of the following locations: background, facility area and gypsum stack. Sample codes descriptions and rationale appear on Table 1 and a sample location map on Figure 3.

2.2 Subsurface Soil Sampling

Four subsurface soil samples will be collected in conjunction with the surface soil samples. Two offsite samples will also be collected to establish background conditions. Sample codes, descriptions and rationale appear on Table 1 and Sample location map on Figure 3.

2.3 Groundwater Sampling

Five groundwater samples will be collected from temporary wells in conjunction with five of the above soil samples. Two of these will serve as background. An additional seven groundwater samples will be collected from existing monitoring wells on site. Five of these are in the surficial aquifer and two in the intermediate aquifer. One potable well at the facility and the closest off site potable well will also be sampled. Analyses for radium 226/228 and Gross alpha will be conducted on the background, one facility surficial aquifer monitoring well, one intermediate aquifer monitoring well and one temporary well. Sample codes, descriptions and rationale appear on Table 2 and a sample location map on Figure 4.

2.4 Surface Water Sampling

Nine surface water samples will be collected. Two will be used to establish background conditions, two will be taken in the areas of the NPDES outfalls and four will be collected downgradient from the respective outfalls. The nineth will be collected from a cooling pond since acidic sediment may react with metal collecting tools while collecting a sediment sample. Analyses for radium 226/228 and

TABLE 1

SOIL SAMPLE SAMPLE CODES, LOCATIONS AND RATIONALE AMAX PHOSPHATE FACLITY PALMETTO, MANATEE COUNTY, FLORIDA

Sample Code	Sample Type	Location	Rationale
AP-SS-01	Surface Soil	Area of Curiosity Creek northeast of the facility	Establish background conditions
AP-SS-02	Surface Soil	Area of Cockroach Creek	Establish background conditions
AP-SS-03	Surface Soil	West side of diammonium phosphate pond	Determine migration of contaminants from diammonium phosphate pond
AP-SS-04	Surface Soil	West of chemical plant	Determine migation of contaminants from the chemical plant
AP-SS-05	Surface Soil	West of cooling ponds	Determine migration of contaminants from source areas
AP-SS-06	Surface Soil	Between ditch surrounding gypsum stack and cooling ponds	Determine migration of contaminants from source areas
AP-SS-07	Surface Soil	Gypsum stack	Characterize contaminants in gypsum
AP-SB-01	Subsurface Soil	In conjunction with AP-SS-01	Establish background conditions
AP-SB-02	Subsurface Soil	In conjuction with AP-SS-02	Establish background conditions
AP-SB-03	Subsurface Soil	In conjunction with AP-SS-03	Determine migration of contaminants from diammonium phosphate pond
AP-SB-04	Subsurface Soil	In conjunction with AP-SS-04	Determine migration of contaminants from the chemical plant.

AP - AMAX Phosphate

SS - Surface Soil SB - Subsurface Soil

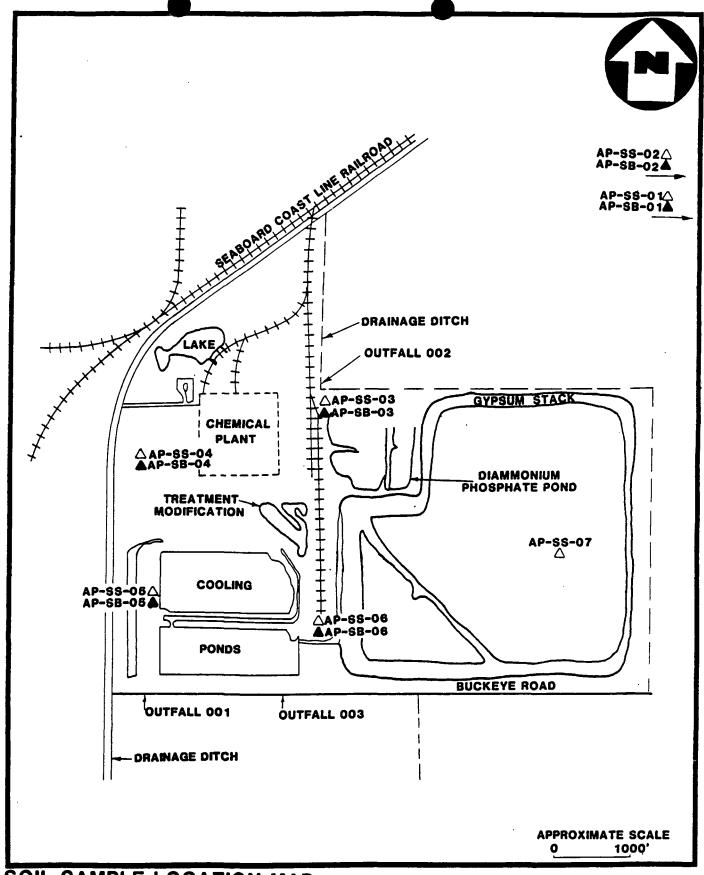
TABLE 1

SOIL SAMPLE SAMPLE CODES, LOCATIONS AND RATIONALE AMAX PHOSPHATE FACLITY PALMETTO, MANATEE COUNTY, FLORIDA

Sample Code	Sample Type	Location	Rationale
AP-SB-05	Subsurface Soil	In conjunction with AP-SS-05	Determine migration of contaminants from source areas
AP-SB-06	Subsurface Soil	In conjunction with AP-SS-06	Determine migration of contamination from gypsum stacks

AMAX Phosphate Surface Soil AΡ

SS Subsurface Soil SB



SOIL SAMPLE LOCATION MAP AMAX PHOSPHATE PALMETTO, MANATEE COUNTY, FLORIDA



TABLE 2

GROUNDWATER SAMPLE SAMPLE CODES, LOCATIONS AND RATIONALE AMAX PHOSPHATE FACLITY PALMETTO, MANATEE COUNTY, FLORIDA

Sample Code	Sample Type	Location	Rationale
AP-TW-01	Groundwater	In conjunction with AP-SS-01	Establish background conditions
AP-TW-02	Groundwater	In conjunction with AP-SS-02	Establish background conditions
AP-TW-03	Groundwater	In conjunction with AP-SS-03	Determine migration of contaminants from diammonium phosphate pond
AP-TW-04	Groundwater	In conjunction with AP-SS-04	Determine migration of contaminants from the chemical plant
AP-TW-05	Groundwater	In conjunction with AP-SS-05	Determine migration of contaminants from source areas
AP-MW-01	Groundwater	Monitoring well 1, surficial aquifer, southeast corner	Detemine migration of contaminants to groundwater
AP-MW-02	Groundwater	Monitoring well 2, surficial aquifer, south of ditch surrounding gypsum stack	Detemine migration of contaminants to groundwater
AP-MW-03	Groundwater	Monitoring well 3, surficial aquifer, east of chemical plant	Detemine migration of contaminants to groundwater
AP-MW-04	Groundwater	Monitoring well 4, surficial aquifer, north of cooling ponds	Detemine migration of contaminants to groundwater
AP-MW-5	Groundwater	Monitoring well 5, surficial aquifer, south of Buckeye Road	Detemine migration of contaminants to groundwater

AP - AMAX Phosphate TW - Temporay Well MW - Monitoring Well PW - Private Well

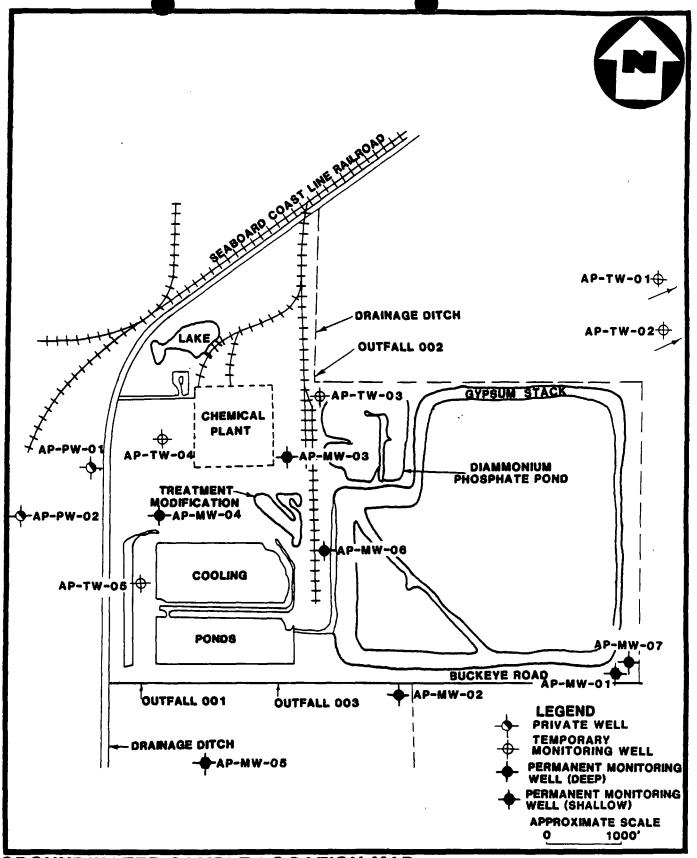
TABLE 2

GROUNDWATER SAMPLE SAMPLE CODES, LOCATIONS AND RATIONALE **AMAX PHOSPHATE FACLITY** PALMETTO, MANATEE COUNTY, FLORIDA

Sample Code	Sample Type	Location	Rationale
AP-MW-06	Groundwater	Monitoring well 6, intermediate agifers, west of the ditch surrounding gypsum stack	Detemine migration of contaminants to groundwater
AP-MW-07	Groundwater	Monitoring well 7, intermediate aquifer, southeast corner	Detemine migration of contaminants to groundwater
AP-PW-01	Groundwater	Private well used by facility	Determine migration of contaminants to potable water
AP-PW-02	Groundwater	Private well, nearest to facility	Determine migration of contaminants to potable water

AMAX Phosphate AΡ TW Temporay Well Monitoring Well MW

Private Well PW



GROUNDWATER SAMPLE LOCATION MAP AMAX PHOSPHATE PALMETTO, MANATEE COUNTY, FLORIDA

FIGURE 4
NUS
CORPORATION

TABLE 3

SEDIMENT AND SURFACE WATER SAMPLE CODES, LOCATIONS AND RATIONALE AMAX PHOSPHATE FACLITY PALMETTO, MANATEE COUNTY, FLORIDA

Sample Code	Sample Type	Location	Rationale
AP-SW-01	Surface Water	Curiosity Creek upgradient from facility	Establish background conditions
AP-SW-02	Surface Water	Cockroach Creek northeast of facility	Establish background conditions
AP-SW-03	Surface Water	West of outfalls 001 and 003	Characterize contaminants from NPDES discharge
AP-SW-04	Surface Water	Downgradient from outfalls 001 and 003	Determine migration of contaminants
AP-SW-05	Surface Water	Bishop Harbor downgradient from outfalls 001 and 003	Determine migration of contaminants
AP-SW-06	Surface Water	Outfall 002	Characterize contaminants from NPDES discharge
AP-SW-07	Surface Water	Downgradient from outfall 002 in Piney Point Creek	Detemine migration of contamination
AP-SW-08	Surface Water	Piney Point Creek at Tampa Bay	Detemine migration of contamination
AP-SW-09	Surface Water	Cooling Pond	Characterize contaminants
AP-SD-01	Sediment	In conjunction with AP-SW-01	Establish background condition
AP-SD-02	Sediment	In conjunctionwith AP-SW-02	Establish background condition
AP-SD-03	Sediment	In conjunction with AP-SW-03	Characterize contaminants from NPDES discharge
AP-SD-04	Sediment	In conjunction with AP-SW-04	Determine migration of contaminants
AP-SD-05	Sediment	In conjunction with AP-SW-05	Determine migration of contaminants
AP-SD-06	Sediment	In conjunction with AP-SW-06	Characterize contaminants from NPDES discharge

.1 1._

AP - AMAX Phosphate

SW - Surface Water

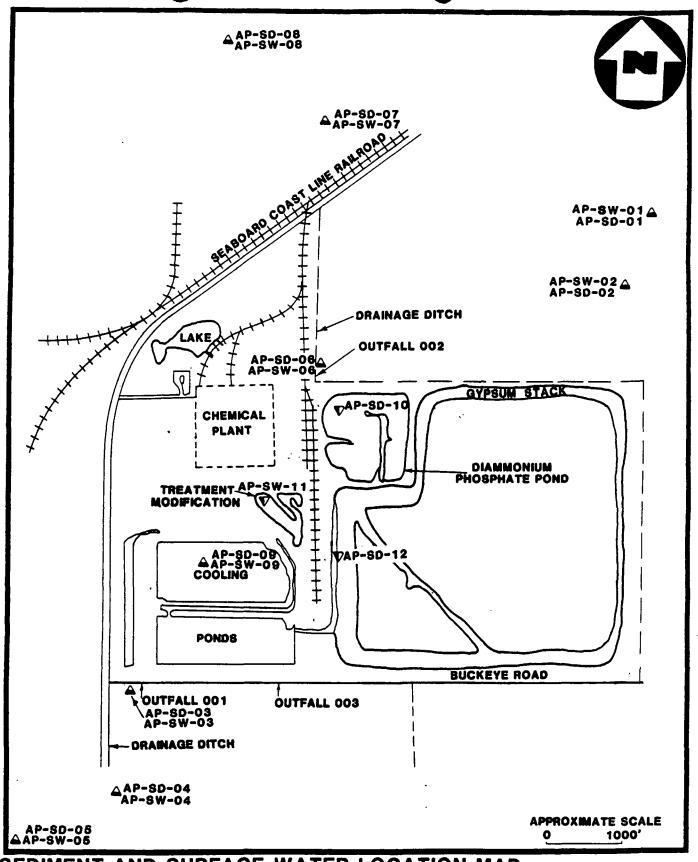
SD - Sediment

TABLE 3

SEDIMENT AND SURFACE WATER SAMPLE CODES, LOCATIONS AND RATIONALE AMAX PHOSPHATE FACLITY PALMETTO, MANATEE COUNTY, FLORIDA

Sample Code	Sample Type	Location	Rationale
AP-SD-07	Sediment	In conjunction with AP-SW-07	Determine migration of contaminants
AP-SD-08	Sediment	In conjunction with AP-SW-08	Determine migration of contaminants
AP-SD-09	Sediment	In conjunction with AP-SW-09	Characterize contaminants
AP-SD-10	Sediment	Diammonium phosphate pond	Characterize contaminants
AP-SD-11	Sediment	Treatment modification pond	Characterize contaminants
AP-SD-12	Sediment	Drainage ditch around gypsum stacks	Determine migration of contaminants

AP - AMAX Phosphate SW - Surface Water SD - Sediment



SEDIMENT AND SURFACE WATER LOCATION MAP AMAX PHOSPHATE PALMETTO, MANATEE COUNTY, FLORIDA



Gross alpha will be performed on one sample collected from each of the following locations: background, and NPDES outfalls. Sample codes, descriptions and rationale appear on Table 3 and sample location map on Figure 5.

2.5 <u>Sediment Sampling</u>

Nine sediment samples will be collected at the same sample locations as the above surface water samples. An additional three sediment samples will be taken at contamination source areas around the facility to include: the ditch surrounding the gypsum stack, diammonium phosphate pond and treatment modification pond. Analyses for radium 226/228 and Gross alpha will be performed on one sample collected from each of the following locations: background, NPDES outfalls and ditch surrounding gypsum stack. Sample codes, descriptions and rationale appear on Table 3 and a sample location map on Figure 5.

2.6 <u>Analytical and Container Requirements</u>

Sample containers used will be in accordance with the requirements specified in the Engineering Support Branch Standard Operating Procedures and Quality Assurance Manual; United States Environmental Protection Agency, Region IV, Environmental Services Division, April 1, 1986. The following is a description of the analysis and types of containers required.

Analyses	Container	Preservatives**
Ext. Organics, Water	1 gal., amber glass*	None
Volatile Organics, Water	40 ml., glass vial*	4 drops conc. HCL to pH <2
Metals, Water	1 liter, plastic	50% HNO ₃ to pH < 2
Cyanide, Water	1 liter, plastic	NaOH to pH >12
Ext. Organics, Soil/Sediment	8 oz., glass*	None
Volatile Organics Soil/Sediment	4 oz., glass*	None

Inorganics,	8 oz., glass*	None
Soil/Sediment		

- * Sample container lids are lined with teflon.
- ** All samples will be iced to 4°C upon collection.

2.7 <u>Methodology</u>

All sample collection, sample preservation, and chain-of-custody procedures used during this investigation will be in accordance with the standard operating procedures as specified in Section 3 and 4 of the Engineering Support Branch Standard Operating Procedures and Quality Assurance Manual; United States Environmental Protection Agency, Region IV, Environmental Services Division, April 1, 1986.

All laboratory analyses and laboratory quality assurance procedures used during this investigation will be in accordance with standard procedures and protocols as specified in the <u>Analytical Support</u> <u>Branch Operations and Quality Assurance Manual</u>; United States Environmental Protection Agency, Region IV, Environmental Services Division; revised June 1, 1985 or as specified by the existing United States Environmental Protection Agency standard procedures and protocols for the contract analytical laboratory program.

REFERENCES

- John G. Cladakis, Senior Vice President, AMAX Chemical Corporation, letter to Dale Twachtmann, Secretary, Department of Environmental Regulation, February 25, 1987. Subject: Industrial Wastewater Permit.
- 2. U.S. Geological Survey, 7.5 minute series Topographic Quadrangle Maps of Florida: Cockroach Bay 1981, Ruskin 1969, Palmetto 1987, Parrish 1987. Scale 1:24,000.
- 3. Al Bishop, Point Source Evaluation Section, FDER, Interoffice Memorandum and Attachment, to Sam Sahebzamani, Southwest District, September 28, 1988. Subject: WQBEL for Royster Phosphate Piney Point Facility.
- 4. Florida Department of Environmental Regulation, <u>Gypsum Stack Status Report</u>, (Southwest District, November 1988).
- 5. Florida Department of Environmental Regulation, Operational Permit (Number 1041-129068) issued to John G. Cladakis, senior vice president, Consolidated Minerals, Inc., May 15, 1987.
- 6. Linda Aller, et al., <u>DRASTIC: A Standardized System for Evaluating Ground Water Pollution Using Hydrogeologic Settings</u>, EPA-600/2-87-035 (Ada, Oklahoma: USEPA, April, 1987).
- 7. C.G. Menke, E.W. Meredith, and W.S. Wetterhall, <u>Water Resources of Hillsborough County</u>, Florida, Florida Geological Survey Report of Investigations No. 25 (Tallahassee, 1961).
- 8. R. Allen Freeze and John A. Cherry, <u>Groundwater</u> (Englewood Cliffs, New Jersey: Prentice Hall, 1979).
- 9. U.S. Department of Commerce, <u>Climatic Atlas of the United States</u>, (Washington, D.C.: GPO June 1968) Reprint: 1983, National Oceanic and Atmospheric Administration.
- 10. U.S. Dept. of Commerce, <u>Rainfall Frequency Atlas of the United States</u>, Technical Paper No. 40, (Washington, D.C.: GPO, 1961).
- 11. NUS Corporation Field Logbook No. F4-1606, for AMAX Phosphate Corporation, TDD No. F4-8905-59. Documentation of facility offsite reconnaissance September 6, 1989.



1927 LAKESIDE PARKWAY SUITE 614 TUCKER, GEORGIA 30084 404-938-7710



December 6, 1989

Mr. A. R. Hanke Site Investigation and Support Branch Waste Management Division Environmental Protection Agency 345 Courtland Street, N. E. Atlanta, Georgia 30365

Subject:

Screening Site Inspection, Phase I

Amax Phosphate Facility

Palmetto, Manatee County, Florida

EPA ID No. FLD043055151 TDD No. F4-8905-59

Dear Mr. Hanke:

Enclosed, please find two (2) copies of the Screening Site Inspection, Phase I report for Amax Phosphate Facility, located in Palmetto, Manatee County, Florida.

Please contact me if you have any questions concerning the Screening Site Inspection, Phase I report.

Very truly yours,

Ralph Hazelton Project Manager

RH/kw

Enclosures (2)

cc: Dorothy Rayfield

Approved:



1927 LAKESIDE PARKWAY SUITE 614 TUCKER, GEORGIA 30084 404-938-7710

C-586-12-9-8

December 6, 1989

Mr. A. R. Hanke Site Investigation and Support Branch Waste Management Division Environmental Protection Agency 345 Courtland Street, N. E. Atlanta, Georgia 30365

Subject:

Screening Site Inspection, Phase I

Amax Phosphate Facility

Palmetto, Manatee County, Florida

EPA ID No. FLD043055151 TDD No. F4-8905-59

Dear Mr. Hanke:

FIT 4 conducted a Phase I Screening Site Inspection of the Amax Phosphate Facility located in Palmetto, Manatee County, Florida. This inspection included a review of EPA and state file material, completion of a target survey, and a reconnaissance of the site on September 6, 1989.

Site Disposition:

EPA Project Manager:

The Amax Phosphate Facility, Piney Point Complex, is located in the northwest section of Manatee County, approximately one-quarter mile inland from Tampa Bay (Refs. 1, 2). The facility was previously owned by Consolidated Minerals, Inc.; however, it was purchased by Royster sometime in 1988 (Ref. 3). The facility includes sulfuric acid plants, phosphoric acid plants, ammoniated fertilizer plants and a gypsum stack/cooling pond complex on approximately 300 acres. Operations began at the facility in 1966 and expanded in 1978 (Ref. 4).

Generally, 95 percent of the phosphate produced in Florida is used in agriculture; 90 percent goes into fertilizers, and 5 percent is used in livestock feed supplements. Large quantities of calcium sulfate (gypsum) are produced as a by-product during the manufacture of phosphoric acid. The calcium sulfate transport water and scrubber water from the phosphoric acid and diammonium phosphate plants make up the process wastewater (Refs. 5, 6). Uranium, vanadium, selenium, chromium can be present in sufficient concentrations to constitute actual or potential by-products (Ref. 7). This wastewater stream is ponded and may be reused to some extent (Ref. 6). The treatment process generates calcium fluoride and calcium phosphate sludge. These sludges are also disposed of in the gypsum disposal area (Ref. 1). Amax's gypsum disposal area is located adjacent to Buckeye Road and is approximately 3,500 square feet in size (Ref. 2).

A groundwater monitoring plan was submitted to the Department of Environmental Regulation in September 1983 and was approved. A groundwater monitoring permit was issued on September 9, 1985, but was withdrawn on October 23,1985. A second permit for groundwater monitoring was issued on March 14, 1987. The following groundwater quality problems have been reported in the

Mr. A.R. Hanke Environmental Protection Agency TDD No. F4-8905-59 December 6, 1989 - page 2

surficial aquifer at this facility: sodium (180 mg/l), sulfate (745 mg/l), iron (2.9 mg/l), manganese (0.31 mg/l) and total dissolved solids (1586 mg/l) (Ref. 4).

Amax Phosphate Facility is located in the Atlantic (Gulf) Coastal Plain hydrogeologic regime consisting of complexly interbedded sand, silt, and clay layers which dip toward the coast (Ref. 8). Karst topography is present within the site locale (Ref. 9). The aquifer normally used in this area is the Floridan aquifer located at a depth of 100-200 feet below land surface (bls) (Ref. 9). The clay sediments of the overlying Hawthorn Formation represent the layer of lowest hydraulic conductivity between the Floridan aquifer and land surface. Local soils have been shown to have a hydraulic conductivity in the 1x10-5 to 1x10-7 range (Ref. 10). The net annual rainfall for this area is 4 inches (Ref. 11). The 1-year, 24-hour rainfall is 4 inches (Ref. 12).

The facility has three surface water outfalls (Ref. 1). Contaminated, Mon-process wastewater is discharged through outfalls 001 and 002; nonrecyclable process water is treated and discharged through outfall 003. Outfalls 001 and 003 discharge into Buckeye Road drainage ditch, which flows southward to Bishop Harbor; outfall 002 discharges into Piney Point Creek (Refs. 2, 5). A man-made canal system is used to transport the effluent from the NPDES-permitted outfalls 001 and 002 to Bishop Harbor. However, this waterway is also used to drain runoff from Buckeye Road, U.S. Highway 41, the railroad lines and agriculture fields (Ref. 1).

During the drive-by reconnaissance, no fishing or any other recreational use was observed in the canal system, although there are numerous species of freshwater fish in the waterway. Numerous fishermen were observed, however, within 1,000 feet of where the outfall discharges into Bishop Harbor (Ref. 13).

Manatee County supplies many of the residents in the vicinity of the site with potable water from Lake Manatee located approximately 30 miles southeast of the site (Ref. 13).

Topographic maps were used to determine the number of private wells within a 4-mile radius of the facility. Approximately 156 private wells identified within a 3-mile radius of the facility and an additional 20 between the 3- to 4-mile radii (Ref. 2). Also, there are many irrigation wells in the site vicinity used for the many lime, orange, and grapefruit groves. There is a private well on the facility and the nearest offsite well is located approximately 500 feet east of the Amax gypsum disposal area. The total depth of this well is 600 feet bls; however, the well casing only extends to a depth of 70 to 80 feet (Ref. 13).

There are no schools or day-care centers within 4 miles of the facility (Ref. 13). The facility is semi-secure with fences around the gypsum disposal area and "No Trespassing" signs are posted (Ref. 13). The Tampa Bay, Cockroach Bay and Bishop Harbor are natural habitats for the federally endangered Florida manatee (Ref. 14).

Mr. A.R. Hanke Environmental Protection Agency TDD No. F4-8905-59 December 6, 1989 - page 3

Based on the factors observed, the information presented and attachments, FIT 4 recommends a Phase II Screening Site Inspection be conducted on a high priority basis for Amax Phosphate Facility. If you have any questions concerning this site, please contact me at NUS Corporation.

Approved:

16. Blackwell

Very truly yours,

Ralph Hazelton Project Manager

RH/gwn

Enclosures

cc: Dorothy Rayfield

NUS CORPORATION

REFERENCES

- 1. John G. Cladakis, Senior Vice President, Amax Chemical Corporation, letter to Dale Twachtmann, Secretary, Department of Environmental Regulation, February 25, 1987. Subject: Industrial Wastewater Permit.
- 2. U.S. Geological Survey, 7.5 minute series Topographic Quadrangle Maps of Florida: Cockroach Bay 1981, Ruskin 1969, Palmetto 1987, Parrish 1987. Scale 1:24,000.
- 3. Al Bishop, Point Source Evaluation Section, FDER, Interoffice Memorandum and Attachment, to Sam Sahebzamani, Southwest District, September 28, 1988. Subject: WQBEL for Royster Phosphate Piney Point Facility.
- 4. Florida Department of Environmental Regulation, <u>Gypsum Stack Status Report</u>, (Southwest District, November 1988).
- 5. Florida Phosphate Council, <u>Billions of Years Ago</u>, (Lakeland, Florida, 1988).
- 6. Florida Department of Environmental Regulation, Operational Permit (Number 1041-129068) issued to John G. Cladakis, senior vice president, Consolidated Minerals, Inc., May 15, 1987.
- 7. Robert F. Kaufmann, James D. Bliss, et al., <u>Effects of Phosphate Mineralization and the Phosphate Industry on Radium-226 in Ground Water of Central Florida</u>, EPA-520-6-77-010 (Ada, Las Vegas, Nevada: USEPA, October 1977).
- 8. Linda Aller, et al., <u>DRASTIC: A Standardized System for Evaluating Ground Water Pollution Using Hydrogeologic Settings</u>, EPA-600/2-87-035 (Ada, Oklahoma: USEPA, April, 1987).
- 9. C.G. Menke, E.W. Meredith, and W.S. Wetterhall, <u>Water Resources of Hillsborough County</u>, Florida, Florida Geological Survey Report of Investigations No. 25 (Tallahassee, 1961).
- 10. R. Allen Freeze and John A. Cherry, <u>Groundwater</u> (Englewood Cliffs, New Jersey: Prentice Hall, 1979).
- 11. U.S. Department of Commerce, <u>Climatic Atlas of the United States</u>, (Washington, D.C.: GPO June 1968) Reprint: 1983, National Oceanic and Atmospheric Administration.
- 12. U.S. Dept. of Commerce, <u>Rainfall Frequency Atlas of the United States</u>, Technical Paper No. 40, (Washington, D.C.: GPO, 1961).
- 13. NUS Corporation Field Logbook No. F4-1606, for Amax Phosphate Corporation, TDD No. F4-8905-59. Documentation of facility offsite reconnaissance September 6, 1989.
- 14. U.S. Fish and Wildlife Service, <u>Gulf Coast, Inventory Map of St. Petersburg, Florida</u>, 1:250,000 (1982).

RECONNAISSANCE CHECKLIST FOR HRS2 CONCERNS

Instructions: Obtain as much "up front" information as possible prior to conducting fieldwork. Complete the form in as much detail as you can, providing attachments as necessary. Cite the source for all information obtained.

Site Name: AMAX PHOSPHATE FACILITY

City, County, State: PALMETTO, MANATER COUNTY FLORIDA

EPA ID No .: FLD 043055151

Person responsible for form: R. HAZELTON

Date: Sept. 6, 1989

Air Pathway

Describe any potential air emission sources onsite: None occeeved

Identify any sensitive environments within 4 miles:

TAMPA BAY, COCKEDACH BAY AND BISHOP HOBOR LOCATED WE

OF THE FACILITY. CRANGE, LINE, AND GRAPETRUIT GROWES IN THE SITE TO VICINITY.

Identify the maximally exposed individual (nearest residence or regularly occupied building - workers

do count): SITE IS ACTIVE; NUMBER OF WORKERS WENGLUN, NEAREST RESIDENT IS APPROX 500 FEET

EAST OF GYPSUM DISPOSAL AREA.

Groundwater Pathway

Identify any areas of karst terrain: KARST TO POGRAPHY IS PRESENT AT THE SITE LOCALE

Identify additional population due to consideration of wells completed in overlying aquifers to the AOC: MANY WELLS IN THE VICINITY OF THE SITE ARE ARTESIAN WITH SHALLOW CASTINGT.

Do significant targets exist between 3 and 4 miles from the site? Approx. 20 ADDITIONAL PRIVATE WELLS

Is the AOC a sole source aquifer according to Safe Drinking Water Act? (i.e. is the site located in Dade, Broward, Volusia, Putnam, or Flagler County, Florida):

Surface Water Pathway

Are there intakes located on the extended 15-mile migration pathway? None

Are there recreational areas, sensitive environments, or human food chain targets (fisheries) along the extended pathway? Bay AREA USED for fishing. Florica Manatee FOUND IN BAY AREA FROM TRESS AND FISHERS IN the AREA NO ALONG MIGRATION PATHWAY

Onsite Exposure Pathway

Is there waste or contaminated soil onsite at 2 feet below land surface or higher? Yes. Gypsom mountas

Is the site accessible to non-employees (workers do not count)? SEMI - FENCER NO TRESPASSING SIGHS POSTED

Are there residences, schools, or day care centers onsite or in close proximity? NO

Are there barriers to travel (e.g., a river) within one mile?

HAZARD RANKING SYSTEM SCORING SUMMARY

FOR

AMAX PHOSPHATE FACILITY
EPA SITE NUMBER FLD043055151
PALMETTO
MANATEE COUNTY, FL
EPA REGION: 4

SCORE STATUS: IN PREPARATION

SCORED BY R. HAZELTON OF NUS CORPORATION ON 11/28/89

DATE OF THIS REPORT: 12/06/89
DATE OF LAST MODIFICATION: 12/06/89

GROUND WATER ROUTE SCORE: 47.35
SURFACE WATER ROUTE SCORE: 14.55
AIR ROUTE SCURE: 0.00

MIGRATION SCORE \$ 28.64

SITE: AMAX PHOSPHATE FACILITY

HRS GROUND WATER ROUTE SCORE

	CATEGORY/FACTOR	RAW DATA	A 6	ASM. VALUE	SCORE
1.	OBSERVED RELEASE	NO	,	Ō	0
2,	ROUTE CHARACTERISTICS		madea - ina hasa e e perts —tr s terren	gas prilyamadin y alle Perel Danz as a all i as a fin y film Perel Service - i a F de little del Mariel Per	a, 5 of 6 ma \$ 76 c c correct Property Section 2 c constitute 664
	DEPTH TO WATER TABLE DEPTH TO BOTTOM OF WASTE	ტ 5	FEET FEET		
	DEPTH TO AQUIFER OF CONCE	IRN 1	FEET	3	රු
	PRECIPITATION EVAPORATION		INCHES INCHES		
	NET PRECIPITATION	4 . O	INCHES	1	1
	PERMEABILITY	1.0X10-3	CM/SEC	2	2
	PHYSICAL STATE			3	. 3
	TOTAL ROUTE CHARACTERISTI	CS SCORE:			12
3.	CONTAINMENT			3	3
۷, "	WASTE CHARACTERISTICS		<u> </u>	(
	TOXICITY/PERSISTENCE:ASSI	GNED VALUE,18			18
	WASTE QUANTITY CUBIC YDS DRUMS GALLONS TONS	2501 0 0			
	TOTAL	2501	CU. YDS	8 8	8
	TOTAL WASTE CHARACTERISTI	CS SCORE:			26
5.	TARGETS		arramenta en electron maio de 1 el dels abbliches dels electrons de 1 el des abbliches de 1 el	adalag () dama () gas may ny den () andron a dalahada hakal () . Mad () 1964 () 1964 () 644 () 644	n dage gage d'e e bree je voeg e i man mi me gen om obsekte.
	GROUND WATER USE			3	9
	DISTANCE TO NEAREST WELL AND TOTAL POPULATION SERVED NUMBER OF HOUSES NUMBER OF PERSONS NUMBER OF CONNECTIONS NUMBER OF IRRIGATED AC	MATRIX VA 593 106 O O	FEET LUE PERSONS	20	20
	TOTAL TARGETS SCORE:				29

SITE: AMAX PHOSPHATE FACILITY

HRS SURFACE WATER ROUTE SCORE

1. DBSERVED RELEASE NO O O O 2. ROUTE CHARACTERISTICS SITE LOCATED IN SURFACE WATER NO SITE WITHIN CLOSED BASIN NO FACILITY SLOPE O.0 % O O O CANDITION SLOPE O.0 % O O O CANDITION SLOPE O.0 % O O O CANDITION SLOPE O.0 % O O O CANDITION SLOPE O.0 % O O O CANDITION SLOPE O.0 % O O O CANDITION SLOPE WATER O.0 % O O O CANDITION SLOPE WATER O.0 % O O O CANDITION SLOPE WATER O.0 % O O O CANDITION SLOPE WATER O.0 % O O O CANDITION SLOPE WATER O.0 % O O O CANDITION SLOPE WATER O.0 % O O CANDITION SLOPE WATER O.0 % O O CANDITION SLOPE WATER O.0 % O O CANDITION SLOPE WATER O.0 % O O CANDITION SLOPE WATER O.0 % O CANDITION SLOPE WATER O.0 % O CANDITION SLOPE WATER O.0 % O CANDITION SLOPE WATER O.0 % O CANDITION SLOPE WATER O.0 % O CANDITION SLOPE WATER O.0 % O CANDITION SLOPE WATER WATER WATER WATER WATER O.0 % O CANDITION SLOPE WATER SOUND FEET DISTANCE TO STATIC MATER OON OFFET DISTANCE TO STATIC MATER ON ON WATER OF PERSONS ON NUMBER OF PERSONS ON		CATEGORY/FACTOR	RAW DATA		I. VALUE	SCORE
SITE LOCATED IN SURFACE WATER NO SITE WITHIN CLOSED BASIN NO FACILITY SLOPE 0.0 % 0.	1.	OBSERVED RELEASE	NO			(j)
SITE WITHIN CLOSED BASIN NO 0.0 % 1	2.	RQUTE CHARACTERISTICS				art e l ben pe i <u>e pres pris pe</u> (bindo e e accident anda rene
DISTANCE TO DOWN-SLOPE WATER 1000 FEET 2 4 PHYSICAL STATE 3 3 TOTAL ROUTE CHARACTERISTICS SCORE: 10 3. CONTAINMENT 3 3 4. WASTE CHARACTERISTICS TOXICITY/PERSISTENCE: ASSIGNED VALUE, 18 WASTE QUANTITY CUBIC YDS 2501 DRUMS 0 GALLONS 0 TONS 0 TOTAL 2501 CU. YDS 8 8 TOTAL WASTE CHARACTERISTICS SCORE: 26 5. TARGETS SURFACE WATER USF 2 6 DISTANCE TO SENSITIVE ENVIRONMENTS 3 6 COASTAL WETLANDS 2000 FEET CRITICAL HABITAT 2000 FEET DISTANCE TO STATIC WATER 2000 FEET CRITICAL HABITAT 2000 FEET DISTANCE TO WATER SUPPLY INTAKE 1 MILE AND NATRIX VOLUE 0 0 NUMBER OF PERSONS 0 NUMBER OF PERSONS 0 NUMBER OF CONNECTIONS 0 NUMBER OF CONNECTIONS 0 NUMBER OF IRRIGOTED ACRES 0		SITE WITHIN CLOSED BASIN FACILITY SLOPE	NO 0.0		o	Ō
DISTANCE TO DOWN—SLOPE WATER 1000 FEET 2 4 PHYSICAL STATE 3 3 TOTAL ROUTE CHARACTERISTICS SCORE: 10 3. CONTAINMENT 3 3 4. WASTE CHARACTERISTICS TOXICITY/PERSISTENCE:ASSIGNED VALUE,18 18 WASTE GUANTITY CUBIC YDS 2501 DRUMS 0 GALLONS 0 TONS 0 TOTAL 2501 CU. YDS 8 TOTAL WASTE CHARACTERISTICS SCORE: 26 5. TARGETS SURFACE WATER USE 2 6 DISTANCE TO SENSITIVE ENVIRONMENTS 3 6 COASTAL WETLANDS 2000 FEET CRITICAL HABITAT 2000 FEET DISTANCE TO STATIC WATER SUPPLY INTAKE > 1 MILE AND NATRIX VALUE 0 NUMBER OF PERSONS 0 NUMBER OF PERSONS 0 NUMBER OF CONNECTIONS 0 NUMBER OF CONNECTIONS 0 NUMBER OF IRRIGATED ACRES 0					;= 1	3
PHYSICAL STATE 3 3 TOTAL ROUTE CHARACTERISTICS SCORE: 10 3. CONTAINMENT 3 3 4. WASTE CHARACTERISTICS TOXICITY/PERSISTENCE: ABSIGNED VALUE, 18 WASTE QUANTITY CUBIC YDS 2501 DRUMS 0 GALLONS 0 TONS 0 TOTAL 2501 CU. YDS 8 8 TOTAL WASTE CHARACTERISTICS SCORE: 26 5. TARGETS SURFACE WATER USE 2 6 DISTANCE TO SENSITIVE ENVIRONMENTS 3 6 COASTAL WETLANDS 2000 FEET FRESH-MATER METLANDS 3000 FEET CRITICAL HABITAT 2000 FEET DISTANCE TO STATIC WATER 7500 FEET DISTANCE TO WATER SUPPLY INTAKE > 1 MILE AND NATRIX VALUE 0 NUMBER OF HOUSES 0 NUMBER OF PERSONS 0 NUMBER OF PERSONS 0 NUMBER OF PERSONS 0 NUMBER OF IRRIGATED ACRES 0						
TOTAL ROUTE CHARACTERISTICS SCORE: 3. CONTAINMENT 3. 3 4. WASTE CHARACTERISTICS TOXICITY/PERSISTENCE:ASSIGNED VALUE,18 MASTE QUANTITY CUBIC YDS 2501 DRUMS 0 GALLONS 0 TONS 0 TOTAL 2501 CU. YDS 8 **TOTAL WASTE CHARACTERISTICS SCORE: 26 5. TARGETS SURFACE WATER USE 2 6 DISTANCE TO SENSITIVE ENVIRONMENTS 3 6 COOSTAL WETLANDS 2000 FEET FRESH-WATER WETLANDS 2000 FEET CRITICAL HABITAT 2000 FEET CRITICAL HABITAT 2000 FEET DISTANCE TO WATER SUPPLY INTAKE > 1 MILE AND NATRIX VALUE 0 NUMBER OF PERSONS 0 NUMBER OF PERSONS 0 NUMBER OF PERSONS 0 NUMBER OF IRRIGATED ACRES 0			200		6 -0-0	·
3. CONTAINMENT 3 3 4. WASTE CHARACTERISTICS TOXICITY/PERSISTENCE:ASSIGNED VALUE,18 WASTE QUANTITY CUBIC YDS 2501 DRUMS 0 GALLONS 0 TONS 0 TOTAL 2501 CU. YDS 8 8 TOTAL WASTE CHARACTERISTICS SCORE: 26 5. TARGETS SURFACE WATER USE 2 6 DISTANCE TO SENSITIVE ENVIPONMENTS 3 6 COASTAL WETLANDS 2000 FEET CRITICAL HABITAT 2000 FEET DISTANCE TO STATIC WATER 7500 FEET DISTANCE TO WATER SUPPLY INTAKE > 1 MILE AND NATRIX VALUE 0 0 NUMBER OF HOUSES 0 NUMBER OF PERSONS 0 NUMBER OF JERSONS 0 NUMBER OF IRRIGATED ACRES 0			·net »	<i>1.3</i>		
4. WASTE CHARACTERISTICS TOXICITY/PERSISTENCE:ASSIGNED VALUE,18 WASTE QUANTITY CUBIC YDS 2501 DRUMS 0 GALLONS 0 TONS 0 TOTAL 2501 CU. YDS 8 8 TOTAL WASTE CHARACTERISTICS SCORE: 26 5. TARGETS SURFACE WATER USE 2 6 DISTANCE TO SENSITIVE ENVIRONMENTS 3 6 COASTAL WETLANDS 2000 FEET CRITICAL HABITAT 2000 FEET DISTANCE TO STATIC WATER 7500 FEET DISTANCE TO WATER SUPPLY INTAKE > 1 MILE AND MATRIX VALUE 0 NUMBER OF HOUSES 0 NUMBER OF HOUSES 0 NUMBER OF CONNECTIONS 0 NUMBER OF IRRIGATED ACRES 0			A.St Vill. 11	::)		
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DRUMS 0 GALLONS 0 TONS 0 TONS 0 TOTAL 2501 CU. YDS 8 8 TOTAL WASTE CHARACTERISTICS SCORE: 26 5. TARGETS SURFACE WATER USE 2 6 DISTANCE TO SENSITIVE ENVIRONMENTS 3 6 COASTAL WETLANDS 2000 FEET FRESH-WATER WETLANDS 3000 FEET CRITICAL HABITAT 2000 FEET DISTANCE TO STATIC WATER 7500 FEET DISTANCE TO WATER SUPPLY INTAKE > 1 MILE AND NATRIX VALUE 0 0 NUMBER OF HOUSES 0 NUMBER OF PERSONS 0 NUMBER OF PERSONS 0 NUMBER OF IRRIGATED ACRES 0	" † =		VALUE,18			18
TOTAL WASTE CHARACTERISTICS SCORE: 26 5. TARGETS SURFACE WATER USF 2 6 DISTANCE TO SENSITIVE ENVIRONMENTS 3 6 CDASTAL WETLANDS 2000 FEET FRESH-WATER WETLANDS 3000 FEET CRITICAL HABITAT 2000 FEET DISTANCE TO STATIC WATER 7500 FEET DISTANCE TO WATER SUPPLY INTAKE > 1 MILE AND NATRIX VALUE 0 TOTAL POPULATION SERVED 0 NUMBER OF HOUSES 0 NUMBER OF PERSONS 0 NUMBER OF IRRIGATED ACRES 0		DRUMS GALLONS	0 0			
SURFACE WATER USE SURFACE WATER USE DISTANCE TO SENSITIVE ENVIRONMENTS COASTAL WETLANDS CRITICAL HABITAT DISTANCE TO STATIC WATER DISTANCE TO WATER SUPPLY INTAKE AND NATRIX VALUE O TOTAL POPULATION SERVED NUMBER OF PERSONS NUMBER OF IRRIGATED ACRES O O NUMBER OF IRRIGATED ACRES		TOTAL	2501	cu. Ybs	ទ	8
SURFACE WATER USE DISTANCE TO SENSITIVE ENVIRONMENTS CDASTAL WETLANDS CDASTAL WETLANDS COORTAL WETLANDS CRITICAL HABITAT DISTANCE TO STATIC WATER AND AND MATRIX VALUE O TOTAL POPULATION SERVED NUMBER OF PERSONS NUMBER OF IRRIGATED ACRES O NUMBER OF IRRIGATED ACRES		TOTAL WASTE CHARACTERISTICS SC	ORE:			26
DISTANCE TO SENSITIVE ENVIRONMENTS COASTAL WETLANDS FRESH-WATER WETLANDS CRITICAL HABITAT DISTANCE TO STATIC WATER AND TOTAL POPULATION SERVED NUMBER OF PERSONS NUMBER OF IRRIGATED ACRES OOO FEET 7500 FEET 7500 FEET AND NATRIX VALUE O NATRIX VALUE O NUMBER OF PERSONS O NUMBER OF IRRIGATED ACRES	5.	TARGETS		ade at aphantiquated deliberal places (PAR In devils 18 deliberal places)		à 17 mars 140 m, 1740 à 200 atr ; par receit press
CDASTAL WETLANDS 2000 FEET FRESH-WATER WETLANDS 3000 FEET CRITICAL HABITAT 2000 FEET DISTANCE TO STATIC WATER 7500 FEET DISTANCE TO WATER SUPPLY INTAKE > 1 MILE AND NATRIX VALUE 0 0 TOTAL POPULATION SERVED 0 NUMBER OF HOUSES 0 NUMBER OF PERSONS 0 NUMBER OF CONNECTIONS 0 NUMBER OF IRRIGATED ACRES 0		SURFACE WATER USE			2	6
DISTANCE TO WATER SUPPLY INTAKE > 1 MILE AND NATRIX VALUE O O TOTAL POPULATION SERVED O NUMBER OF HOUSES O NUMBER OF PERSONS O NUMBER OF CONNECTIONS O NUMBER OF IRRIGATED ACRES O		COASTAL WETLANDS FRESH-WATER WETLANDS	2000 (3000	FEET	3	ద
TOTAL TARGETS SCORE: 12		DISTANCE TO WATER SUPPLY INTAK AND TOTAL POPULATION SERVED NUMBER OF HOUSES NUMBER OF PERSONS NUMBER OF CONNECTIONS	E > 1 MATRIX VA O O O O	MILE	O	0
		TOTAL TARGETS SCORE:				12

SITE: AMAX PHOSPHATE FACILITY

HRS AIR ROUTE SCORE

CATEGORY	/FACTOR	RAW D	ATA ASN.	VALUE	SCORE
1. OBSERVED	RELEASE	NC		Ö	0

2. WASTE CHARACTERISTICS

REACTIVITY:

MATRIX VALUE

INCOMPATIBILITY

TOXICITY

WASTE QUANTITY CUBIC YARDS

DRUMS GALLONS TONS

TOTAL

TOTAL WASTE CHARACTERISTICS SCORE:

NZA

3. TARGETS

POPULATION WITHIN 4-MILE RADIUS

- O to 0.25 mile
- 0 to 0.50 mile
- O to 1.0 mile
- O to 4.0 miles

DISTANCE TO SENSITIVE ENVIRONMENTS

COASTAL NETLANDS FRESH-WATER VETLANDS CRITICAL HABITAT

DISTANCE TO LAND USES COMMERCIAL/INDUSTRIAL PARK/FOREST/RESIDENTIAL AGRICULTURAL LAND PRIME FARMLAND HISTORIC SITE WITHIN VIEW?

TOTAL TARGETS SUCRE:

AVA

AIR ROUTE SCORE (Sa) = 0.00

HAZARD RANKING SYSTEM SCORING CALCULATIONS FOR

SITE: AMAX PHOSPHATE FACILITY
AS OF 12/06/89

GROUND WATER ROUTE SCORE

ROUTE CHARACTERISTICS 12
CONTAINMENT X 3
WASTE CHARACTERISTICS X 26
TARGETS X 29

 $= 27144 /57,330 \times 100 = 47.35 = 8_{00}$

SURFACE WATER ROUTE SCORE

ROUTE CHARACTERISTICS 10 CONTAINMENT X 3 WASTE CHARACTERISTICS X 26 TARGETS X 12

= $9360 / 64,350 \times 100 = 14.55 = S_{mw}$

AIR ROUTE SCORE

OBSERVED RELEASE 0 /35,100 X 100 = 0.00 = S_{axr}

SUMMARY OF MIGRATION SCORE CALCULATIONS

	S	Se
GROUND WATER ROUTE SCORE (Saw)	4735	2242.02
SURFACE WATER ROUTE SCORE (S.w)	14.55	211.70
AIR ROUTE SCORE (Sair)	0.00	0.00
Segut Segut Segut		2453.72
J (Sem + Sem + Seman)		49.54
Sm = 1 (Smgw + Smgw + Smgw, +		28.64

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY REGION IV COLLEGE STATION RD. ATHENS, GA 30613

MEMORANDUM

DATE: 01/23/91

SUBJECT: Results of Radiochemical Analyses

Projects 91-025, AMAX Phosphate:

90-439, IMC/New Wales; 90-440, Farmland Ind.



FROM:

Robert W. Knight

Chief, Laboratory Evaluation/Quality Assurance Section

TO:

Phil Blackwell, NUS Corporation

Attached are partial results of sample analyses for the subject projects. The analyses were performed by the U.S. EPA Eastern Environmental Radiation Laboratory, Montgomery, AL. As you can see from the brief memorandum attached to the data, results for radium 226 in soil and radium 228 in waters are still pending. These results will be forwarded to you as soon as they are received by ESD.

Please note that for two samples, IMC/New Wales TW-01, and Farmland Industries TW-01, two radium 226 values were reported for each sample. According to the laboratory's explanation, these two samples were filtered and the analysis was performed on both the filtrate and solids portions of the each. By each radium 226 value for the two samples, the result has been labeled either "filtered", or "solids", to denote which fraction of the sample the result is associated with.

A QA review was not performed on the radiochemical analyses. If you have technical questions concerning the data, please contact the individuals listed on the laboratory's cover memo.

ATTACHMENT

cc: Al Hanke, WMD, w/o attachment

Dorothy Payfield

SITE AMAX PHOSPHA PROJECT # 91-025	TE (FI	T)	c	STATE FL		R ROGER FRANKLIM EK 10/15/90	(RUS)
SOILVOA BOOKED	29	DATA	RECEIVED	01/14/91	FOR 2	25 SAMPLES	
H20VOA BOOKED	24	DATA	RECEIVED	01/14/91	FOR 2	21 SAMPLES	
SOILEXT BOOKED	28	DATA	RECEIVED	01/14/91	FOR 2	24 SAMPLES	
H20EXT BOOKED	24	DATA	RECEIVED	01/14/91	FOR 2	21 SAMPLES	
SOILPEST BOOKED	28	DATA	RECEIVED	01/14/91	FOR 2	24 SAMPLES	
H2OPEST BOOKED	24	DATA	RECEIVED	01/14/91	FOR 2	21 SAMPLES	
SOILMET BOOKED	28	DATA	RECEIVED	12/10/90	FOR 2	24 SAMPLES	
H2OMET BOOKED	24	DATA	RECEIVED	12/10/90	FOR 2	21 SAMPLES	
SOILON BOOKED	28	DATA	RECEIVED	12/10/90	FOR 2	24 SAMPLES	ζ ^Ξ .
H2OCN BOOKED	24	DATA	RECEIVED	12/10/90	FOR 2	21 SAMPLES	, .·
						•	
SOILOTH1 BOOKED	7	DATA	RECEIVED	/ /	FOR	SAMPLES	
SOILOTH2 BOOKED	0	DATA	RECEIVED	/ /	FOR	SAMPLES	
H2OOTH1 BOOKED	7	DATA	RECEIVED	, ,	FOR	SAMPLES	
Н200ТН2 ВООКЕД	0	DATA	RECEIVED	/ /	FOR	SAMPLES	
OTHER1 BOOKED	o	DATA	RECEIVED	/ /	FOR	SAMPLES	
OTHER2 BOOKED	O	DATA	RECEIVED	/ /	FOR	SAMPLES	
OV REQUESTED? N							

clp

LAB(CLP/ESD)



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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY Region IV

Environmental Services Division College Station Road, Athens. Ga. 30613

CTLANTS GA.

****MEMORANDUM*****

DATE: 01/05/91

SUBJECT: Results of Purgeable Organic Analysis;

91-025 AMAX PHOSPHATE FACIL

PALMETTO FL CASE NO: 15099

FROM: Robert W. Knight

Chief, Laboratory Evaluation/Quality Assurance Section

TO: PHIL BLACKWELL

Attached are the results of analysis of samples collected as part of the subject project.

As a result of the Quality Assurance Review, certain data qualifiers may have been placed on the data. Attached is a DATA QUALIFIER REPORT which explains the reasons that these qualifiers were required.

If you have any questions please contact me.

ATTACHMENT

C.C.

ORGANIC DATA QUALIFIER REPORT

Case Number 15099

Project Number

91-025 SAS Number

Site ID. Amax Phosphate Facil, Palmetto, FL.

Affected Samples	Compound or Fraction	Flag <u>Used</u>	Reason
Volatiles DY143,157,158,161 163,165,167,169, 172,175,327-329 DY158	, 2-butanone carbon disulfide	R J	low response factor
		Ū	-quantituditon rimito
<u>Extractables</u>		_	
all samples	di-n-butylphthalate	J	low QC spike recovery
n	benzo(a)anthracene	J J	low QC spike recovery <quantitation limit<="" td=""></quantitation>
DY146	all positives	J	<quantitation limit<="" td=""></quantitation>
Pesticides			

Pesticides none

; **b**

ORGANIC DATA QUALIFIER REPORT

Case Number 15099

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Project Number

91-025 SAS Number

Site ID. Amax Phosphate Facil, Palmetto, FL.

Affected Samples	Compound or Fraction	Flag <u>Used</u>	Reason
<u>Volatiles</u> DY173,170,152,155 140,138,144	all positives	J	<quantitation limit<="" td=""></quantitation>
Extractables all samples bis	(2-chloroisopropyl)ether nitrobenzene 1,2,4-trichlorobenzene	R u	nacceptable recovery blind spike macceptable recovery blind spike unacceptable recovery blind spike
, DY168,160,136 DY168,136	2-chloronaphthalene 3-nitroaniline phenanthrene pyrene	R R J J J	unacceptable recovery blind spike unacceptable recovery blind spike <quantitation <quantitation="" limit="" limit<="" td=""></quantitation>
DY168,160,136	benzo(a)anthracene chrysene benzo(b)fluoranthene benzo(a)pyrene	J J J	<pre><quantitation <quantitation="" limit="" limit<="" pre=""></quantitation></pre>
DY164,159,170,153 DY160 DY160,136	all positives acenaphthene anthracene indeno(1,2,3-cd)pyrene	J J J	<pre><quantitation <quantitation="" limit="" limit<="" pre=""></quantitation></pre>
DY136 DY150 DY160 DY156,159,162,164	benzo(g,h,i)perylene benzoic acid acenaphthene	J J J	<pre><quantitation <quantitation="" but="" factor="" limit="" low="" pre="" present<="" response=""></quantitation></pre>
166,168,170,171, 173,174 Pesticides	, acenaphthene	R	low response factor
DY144	alpha-Chlordane gamma-Chlordane	J J	<quantitation <quantitation="" limit="" limit<="" td=""></quantitation>

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM

01/04/91 EPA-REGION IV ESD. ATHENS. GA.

PURGEABLE ORGANICS DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51642 SAMPLE TYPE: GROUNDWA SOURCE: AMAX PHOSPHATE FACIL STATION ID: PB-01 PROG ELEM: NSF COLLECTED BY: M GORDON ** CITY: PALMETTO ST: FL ** ** COLLECTION START: 10/15/90 0630 STOP: 00/00/00 ** ** * * * * D. NO.: Y325 * * CASE NO.: 15099 SAS NO.: ** ANALYTICAL RESULTS UG/L UG/L ANALYTICAL RESULTS 100 CHLOROMETHANE 1.2-DICHLOROPROPANE CIS-1,3-DICHLOROPROPENE BROMOMETHANE 10U TRICHLOROETHENE (TRICHLOROETHYLENE) 100 VINYL CHLORIDE CHLOROETHANE DIBROMOCHLOROMETHANE 100 METHYLENE CHLORIDE 20Ú 1.1.2-TRICHLOROETHANE ŽÕŬ ACETONE BÉNZENÉ 5Ü CARBON DISULFIDE
1,1-DICHLOROETHENE(1,1-DICHLOROETHYLENE) TRANS-1, 3-DICHLOROPROPENE BROMOFORM 50 1,1-DICHLOROETHANE 10U METHYL ISOBUTYL KETONE 1,2-DICHLOROETHENE (TOTAL) 100 METHYL BUTYL KETONE 50 CHLOROFORM 50 50 50 TETRACHLOROETHENE (TETRACHLOROETHYLENE) 1,2-DICHLOROETHANE 1,1,2,2-TETRACHLOROETHANE
TOLUENE 100 METHYL ETHYL KETONE 1,1,1-TRICHLOROETHANE CHLOROBENZENE 5U 5Ú CARBON TETRACHLORIDE ETHYL BENZENE 10Ú VINYL · ACETATE STYRENE 5U BROMODICHLOROMETHANE TOTAL XYLENES

REMARKS

REMARKS

FOOTNOTES **+A−AVÉRAGE VALUE** *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

REMARKS

REMARKS

FOOTNOTES

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REMARKS

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FOOTNOTES

*A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

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*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

REMARKS

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PURGEABLE ORGANICS DATA REPORT
PROJECT NO. 91-025 SAMPLE NO. 51646 SAMPLE TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON
**
                                                                                                              **
    SOURCE: AMAX PHOSPHATE FACIL
                                                                          ST: FL
                                                            CITY: PALMETTO
* *
                                                                                                              **
                                                            COLLECTION START: 10/17/90 1620 STOP: 00/00/00
    STATION ID: SW-04
* *
                                                                                                              * *
                                                                                                              **
* *
    CASE NO.: 15099
                                        SAS NO.:
                                                             D. NO.: Y167
                                                                                                              **
***
                    ANALYTICAL RESULTS
   UG/L
                                                           UG/L
                                                                            ANALYTICAL RESULTS
        CHLOROMETHANE
                                                                1,2-DICHLOROPROPANE
    100
    100
        BROMOMETHANE
                                                             50
                                                                 CIS-1,3-DICHLOROPROPENE
                                                                 TRICHLOROETHENE (TRICHLOROETHYLENE)
        VINYL CHLORIDE
                                                             ŠŪ.
    100
        CHLOROETHANE
                                                                 DIBROMOCHLOROMETHANE
    100
                                                             5U
        METHYLENE CHLORIDE
                                                                 1.1.2-TRICHLOROETHANE
    20Ū
                                                             50
    100
        ACETONE
                                                             5Ú
                                                                 BENZENE
                                                                 TRANS-1.3-DICHLOROPROPENE
        CARBON DISULFIDE
     5U
                                                             5U
        1.1-DICHLOROETHENE(1,1-DICHLOROETHYLENE)
                                                                 BROMOFORM
                                                                METHYL ISOBUTYL KETONE
METHYL BUTYL KETONE
TETRACHLOROETHENE(TETRACHLOROETHYLENE)
        1,1-DICHLOROETHANE
                                                             10Ŭ
        1,2-DICHLOROETHENE (TOTAL)
                                                             100
        CHLOROFORM
1,2-DICHLOROETHANE
     ŠŬ.
                                                             5Ū
                                                                 1,1,2,2-TETRACHLOROETHANE
TOLUENE
     5U
                                                             50
   10UR MÉTHYL ETHYL KETONE
                                                             ŠŬ.
        1.1.1-TRICHLOROETHANE
                                                             5Ù
                                                                 CHLOROBENZENE
        CARBON TETRACHLORIDE
                                                             511
                                                                 ETHYL BENZENE
     511
        VINYL ACETATE
                                                                 STYRENE
        BROMODICHLOROMETHANE
                                                                 TOTAL XYLENES
```

REMARKS

^{*}NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *A-AVERAGE VALUE *NA-NOT ANALYZED

^{*}K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT. *R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

PURGEABLE ORGANICS DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51647 SAMPLE TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON SOURCE: AMAX PHOSPHATE FACIL STATION ID: SW-08 COLLECTION START: 10/17/90 1605 STOP: 00/00/00 ** ** * * ** * * ** ** ** CASE NO.: 15099 SAS NO.: D. NO.: Y165 ** * * UG/L ANALYTICAL RESULTS UG/L ANALYTICAL RESULTS CHLOROMETHANE 5U 1.2-DICHLOROPROPANE BROMOMETHANE 5U CIS-1.3-DICHLOROPROPENE 100 VINYL CHLORIDE TRICHLOROETHENE (TRICHLOROETHYLENE) 100 CHLOROETHANE METHYLENE CHLORIDE 10U 5U DIBROMOCHLOROMETHANE 300 5Ü 1.1.2-TRICHLOROETHANE BENZENE 20Ŭ ACETONE 5Ü CARBON DISULFIDE 5Ŭ TRANS-1.3-DICHLOROPROPENE 1,1-DICHLOROETHENE(1,1-DICHLOROETHYLENE) 5U BROMOFORM 1,1-DICHLOROETHANE 10U METHYL ISOBUTYL KETONE 1.2-DICHLOROETHENE (TOTAL) METHYL BUTYL KETONE CHLOROFORM TETRACHLOROETHENE (TETRACHLOROETHYLENE) 5U 1,1,2,2-TETRACHLOROETHANE 5Ú 1,2-DICHLOROETHANE 5υ 10UR MÉTHYL ETHYL KETONE 5U 1,1,1-TRICHLOROETHANE 50 TOLUENE CHLOROBENZENE ETHYL BENZENE 5U 5Ŭ CARBON TETRACHLORIDE 50 VINYL ACETATE STYRENE 10Ú 5U BROMODICHLOROMETHANE TOTAL XYLENES

REMARKS

REMARKS

REMARKS

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PURGEABLE ORGANICS DATA REPORT
PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1505 STOP: 00/00/00
    PROJECT NO. 91-025 SAMPLE NO. 51649 SAMPLE TYPE: SOIL
* *
                                                                                                                    * *
    SOURCE: AMAX PHOSPHATE FACIL
* *
                                                                                                                    * *
* *
    STATION ID: SD-11
                                                                                                                    **
                                                                                                                    **
* *
    CASE NO.: 15099
                                          SAS NO.:
                                                                D. NO.: Y159
                                                                                                                    * *
UG/KG
                     ANALYTICAL RESULTS
                                                              UG/KG
                                                                                ANALYTICAL RESULTS
    21U
21U
                                                                11U 1.2-DICHLOROPROPANE
11U CIS-1.3-DICHLOROPROPENE
11U TRICHLOROETHENE(TRICHLOROETHYLENE)
       CHLOROMETHANE
        BROMOMETHANE
    Žiŭ
        VINYL CHLORIDE
        CHLOROETHANE
    210
                                                                    DIBROMOCHLOROMETHANE
                                                                110
        METHYLENE CHLORIDE
                                                                110
    110
                                                                    1.1.2-TRICHLOROETHANE
                                                                    BENZENE
        ACETONE
    21U
                                                                110
        CARBON DISULFIDE
                                                                11U TRANS-1.3-DICHLOROPROPENE
    11U
    11U 1,1-DICHLOROETHENE(1,1-DICHLOROETHYLENE)
                                                                11U BROMOFORM
    11U 1,1-DICHLOROETHANE
                                                                    METHYL ISOBUTYL KETONE
                                                                210
    11U 1,2-DICHLOROETHENE (TOTAL)
11U CHLOROFORM
                                                                21Ú
                                                                    METHYL BUTYL KETONE
                                                                110
                                                                    TETRACHLOROETHENE (TETRACHLOROETHYLENE)
        1,2-DICHLOROETHANE
                                                                    1,1,2,2-TETRACHLOROETHANE
TOLUENE
    110
                                                                110
    210 METHYL ETHYL KETONE
                                                                110
        1.1.1-TRICHLOROETHANE
                                                                110
                                                                    CHLOROBENZENE
    110
        CARBON TETRACHLORIDE
                                                                    ETHYL BENZENE
    1111
                                                                110
    21U VINYL ACETATE
                                                                118
                                                                    STYRENE
    11U BROMODICHLOROMETHANE
                                                                11U TOTAL XYLENES
                                                                 53 PERCENT MOISTURE
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REMARKS

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PURGEABLE ORGANICS DATA REPORT
** PROJECT NO. 91-025 SAMPLE NO. 51650 SAMPLE TYPE: SURFACEWA SOURCE: AMAX PHOSPHATE FACIL ** STATION ID: SW-11 ** STATION ID: SW-11 ** STATION ID: SW-11 ** STATION ID: SW-11 ** STATION ID: SW-11 ** STATION ID: SW-11 ** STATION ID: SW-11 ** STATION ID: SW-11 ** STATION ID: SW-11 ** STATION ID: SW-11 ** STATION ID: SW-11 ** STATION ID: SW-11 ** STATION ID: SW-11 ** STATION ID: SW-11 ** STATION ID: SW-11 ** STATION ID: SW-11 ** STATION ID: SW-11 ** SW-12 ** STATION ID: SW-11 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 ** SW-12 **
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* *
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               CASE NO.: 15099
                                                                                                                                        SAS NO.:
                                                                                                                                                                                                             D. NO.: Y158
* *
                                                                                                                                                                                                                                                                                                                                                                                    * *
UG/L
                                                                      ANALYTICAL RESULTS
                                                                                                                                                                                                        UG/L
                                                                                                                                                                                                                                                                 ANALYTICAL RESULTS
               10U CHLOROMETHANE
                                                                                                                                                                                                                         1.2-DICHLOROPROPANE
               10U BROMOMETHANE
                                                                                                                                                                                                                          CIS-1.3-DICHLOROPROPENE
                                                                                                                                                                                                                           TRICHLOROETHENE (TRICHLOROETHYLENE)
               100 VINYL CHLORIDE
               100 CHLOROETHANE
                                                                                                                                                                                                                           DIBROMOCHLOROMETHANE
               70U METHYLENE CHLORIDE
                                                                                                                                                                                                                           1.1.2-TRICHLOROETHANE
               30U ACETONE
                                                                                                                                                                                                                           BENZENE
                             CARBON DISULFIDE
                  41
                                                                                                                                                                                                                5Ü
                                                                                                                                                                                                                           TRANS-1,3-DICHLOROPROPENE
                 5U 1,1-DICHLOROETHENE(1,1-DICHLOROETHYLENE)
5U 1,1-DICHLOROETHANE
5U 1,2-DICHLOROETHENE (TOTAL)
5U CHLOROFORM
                                                                                                                                                                                                                           BROMOFORM
                                                                                                                                                                                                                           METHYL ISOBUTYL KETONE
METHYL BUTYL KETONE
TETRACHLOROETHENE(TETRACHLOROETHYLENE)
                                                                                                                                                                                                              100
                                                                                                                                                                                                              100
                  5U 1,2-DICHLOROETHANE
                                                                                                                                                                                                                            1.1.2.2-TETRACHLOROETHANE
            10UR METHYL ETHYL KETONE
                                                                                                                                                                                                                           TÓLÚENE
                  5U 1.1.1-TRICHLOROETHANE
                                                                                                                                                                                                                50
                                                                                                                                                                                                                           CHLOROBENZENE
                  5U CARBON TETRACHLORIDE
                                                                                                                                                                                                                           ETHYL BENZENE
               100 VINYL ACETATE
                                                                                                                                                                                                                           STYRENE
                             BROMODICHLOROMETHANE
                                                                                                                                                                                                                           TOTAL XYLENES
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REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

^{*}R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

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PURGEABLE ORGANICS DATA REPORT
PROJECT NO. 91-025 SAMPLE NO. 51651 SAMPLE TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON SOURCE: AMAX PHOSPHATE FACIL
                                                                                                                * *
**
                                                                                                                **
    STATION ID: SW-09
                                                            COLLECTION START: 10/17/90 1515 STOP: 00/00/00
**
                                                                                                                * *
* *
                                                                                                                * *
**
    CASE NO.: 15099
                                         SAS NO.:
                                                             D. NO.: Y163
                                                                                                                * *
   ANALYTICAL RESULTS
                                                            UG/L
   UG/L
                                                                             ANALYTICAL RESULTS
    10U CHLOROMETHANE
                                                              5U 1,2-DICHLOROPROPANE
        BROMOMETHANE
                                                                 CIS-1,3-DICHLOROPROPENE
    100
        VINYL CHLORIDE
CHLOROETHANE
                                                                  TRICHLOROETHENE (TRICHLOROETHYLENE)
    10U
    100
                                                                  DIBROMOCHLOROMETHANE
        METHYLENE CHLORIDE
                                                                 1.1.2-TRICHLOROETHANE
    50U
                                                              ŠŨ.
        ACETONE
                                                                 BENZENE
    50U
                                                              5Ú
        CARBON DISULFIDE
1,1-DICHLOROETHENE(1,1-DICHLOROETHYLENE)
                                                              50
                                                                 TRANS-1, 3-DICHLOROPROPENE
                                                                 BROMOFORM
        1,1-DICHLOROETHANE
                                                                 METHYL ISOBUTYL KETONE
                                                              100
                                                                 METHYL BUTYL KETONE
TETRACHLOROETHENE(TETRACHLOROETHYLENE)
        1,2-DICHLOROETHENE (TOTAL)
                                                              10U
     5U
        CHLOROFORM
                                                              50
50
        1,2-DICHLOROETHANE
                                                                 1,1,2,2-TETRACHLOROETHANE
TOLUENE
     5U
   10UR MÉTHYL ETHYL KETONE
        1,1,1-TRICHLOROETHANE
                                                              ŠŬ
                                                                  CHLOROBENZENE
     50
     5U
        CARBON TETRACHLORIDE
                                                                 ETHYL BENZENE
    10U VINYL ACETATE
                                                                  STYRENE
     5U BROMODICHLOROMETHANE
                                                                  TOTAL XYLENES
```

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

REMARKS

PURGEABLE ORGANICS DATA REPORT PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1520 STOP: 00/00/00 PROJECT NO. 91-025 SAMPLE NO. 51653 SAMPLE TYPE: SOIL SOURCE: AMAX_PHOSPHATE FACIL * * ** ** ** STATION ID: SD-07 * * * * * * ** CASE NO.: 15099 ** SAS NO.: D. NO.: Y160 ** UG/KG ANALYTICAL RESULTS UG/KG ANALYTICAL RESULTS 7U 1,2-DICHLOROPROPANE 7U CIS-1,3-DICHLOROPROPENE 7U TRICHLOROETHENE(TRICHLOROETHYLENE) 7U DIBROMOCHLOROMETHANE 130 CHLOROMETHANE 130 BROMOMETHANE VINYL CHLORIDE CHLOROETHANE 13U 1,1,2-TRICHLOROETHANE BENZENE ŻŬ. 7Ú METHYLENE CHLORIDE 300 ACETONE ŻŬ. CARBON DISULFIDE 7Ú TRANS-1, 3-DICHLOROPROPENE 1,1-DICHLOROETHENE(1,1-DICHLOROETHYLENE) BROMOFORM 7U 1,1-DICHLOROETHANE METHYL ISOBUTYL KETONE 1.2-DICHLOROETHENE (TOTAL) CHLOROFORM 130 METHYL BUTYL KETONE ŽŬ. TETRACHLOROETHENE (TETRACHLOROETHYLENE) 7U 1.2-DICHLOROETHANE 7Ü 7Ü 1,1,2,2-TETRACHLOROETHANE TOLUENE 13U MÉTHYL ETHYL KETONE 1,1,1-TRICHLOROETHANE ŻŨ. CHLOROBENZENE 7U 7U CARBON TETRACHLORIDE 711 ETHYL BENZENE 13U VINYL ACETATE 7Ū STYRENE 7U BROMODICHLOROMETHANE TOTAL XYLENES 7U PERCENT MOISTURE

REMARKS

REMARKS

DII	RGEARLE (ORGANICS DATA	REPORT			PATRE	GION IN E	SU, AIRE	NS, GA.				01/04/91
** ** ** **	* * * * * PROJEC SOURC!	* * * * * * * * * * * * * * * * * * *	* * * * * SAMPLE	* * * * * NO. 51654	* * * * * SAMPLE T	* * YPE:	* * * * * * SURFACEWA	PROG CITY:	ELEM: NSF PALMETTO	COLLECTED	* * * * * * * BY: M GORDON ST: FL 1515 STOP:		* * * * *** ** ** **
**	CASE 1	NO.: 15099			SAS NO	1. :		D. N	O.: Y161				**
**	* * * * * '	* * * * * * *	ANALYTICAL		* * * * *	* *	* * * * *	* * * * * UG/L	* * * * *		AL RESULTS	* * * * * :	. * * * ***
	100 H 100 H 100 H 100 H 100 H 100 H 100 H 100 H 100 H 100 H	CHLOROMETHANE BROMOMETHANE VINYL CHLORID CHLOROETHANE METHYLENE CHL ACETONE CARBON DISULF 1,1-DICHLOROE 1,1-DICHLOROE 1,2-DICHLOROE CHLOROFORM 1,2-DICHLOROE METHYL ETHYL 1,1-TRICHLO CARBON TETRACI BROMODICHLOROE BROMODICHLOROE	ORIDE IDE IHENE(1,1-D IHANE IHENE (TOTA IHANE ETONE ROETHANE ILORIDE		YLENE)			50000000000000000000000000000000000000	CÍS-1,3-DI TRICHLOROE DIBROMOCHL 1,1,2-TRIC BENZENE TRANS-1,3- BROMOFORM METHYL BUT TETRACHLOR	CHLOROPROPE THENE (TRICH OROMETHANE CHLOROETHANE DICHLOROPRO BUTYL KETONE ROETHENE (TET TRACHLOROET	LÖROETHYLENE; PENE E RACHLOROETHY!		

REMARKS

01/04/91

REMARKS

REMARKS

FOOTNOTES

DIID	RGEABLE ORGANICS DATA REPORT	LFA-REGION IV E.	DU, ATHENS, MA.	01/04/91
***		* * * * * * * * * * * * * * * * * * *		ORDON **
**	CASE NO.: 15099	SAS NO.:	D. NO.: Y157	**
***	* * * * * * * * * * * * * * * * * * *		UG/L ANALYTICAL RESU	* * * * * * * * * * * * * * * * * * *
	10U CHLOROMETHANE 10U BROMOMETHANE 10U VINYL CHLORIDE 10U CHLOROETHANE 20U METHYLENE CHLORIDE 10U ACETONE 5 CARBON DISULFIDE 5U 1,1-DICHLOROETHENE(1,1-DICHLOROETHANE 5U 1,2-DICHLOROETHENE (TOTAL) 5U CHLOROFORM 5U 1,2-DICHLOROETHANE 5U 1,2-DICHLOROETHANE 5U 1,2-DICHLOROETHANE 5U 1,2-DICHLOROETHANE 5U 1,2-DICHLOROETHANE 5U CARBON TETRACHLORIDE 10UR METHYL ETHYL KETONE 5U 1,1-TRICHLOROETHANE 5U CARBON TETRACHLORIDE 10U VINYL ACETATE 5U BROMODICHLOROMETHANE	ETHYLENE)	5U 1,2-DICHLOROPROPANE 5U CIS-1,3-DICHLOROPROPENE 5U TRICHLOROETHENE(TRICHLOROETH' 5U DIBROMOCHLOROMETHANE 5U 1.1.2-TRICHLOROETHANE 5U BENZENE 5U TRANS-1,3-DICHLOROPROPENE 5U BROMOFORM 10U METHYL ISOBUTYL KETONE 10U METHYL BUTYL KETONE 5U TETRACHLOROETHENE(TETRACHLOROETHANE 5U 1,1,2,2-TETRACHLOROETHANE 5U TOLUENE 5U CHLOROBENZENE 5U STYRENE 5U STYRENE 5U TOTAL XYLENES	

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

^{*}R-GC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

PURGE	ABLE ORGANICS DATA REPORT	SD, AMERS, GA.	01,04,01
***			* * * * * * * * * ***
**	PROJECT NO. 91-025 SAMPLE NO. 51662 SAMPLE TYPE: GROUNDWA	PROG ELEM: NSF COLLECTED BY: M GORDON	**
**	SOURCE: AMAX PHOSPHATE FACIL	CITY: PALMETTO ST: FL	**
**	STATION ID: TW-04	COLLECTION START: 10/18/90 1040 STOP:	00/00/00 **
**		·	**
**	CASE NO.: 15099 SAS NO.:	D. NO.: Y175	**
***			* * * * * * * * * * ***
(IG/L ANALYTICAL RESULTS	UG/L ANALYTICAL RESULTS	
	40U CUI OPOMETUANE	FIL 4 O DICH COODDONALE	
	10U CHLOROMETHANE 10U BROMOMETHANE	5U 1,2-DICHLOROPROPANE	
	10U BROMOMETHANE 10U VINYL CHLORIDE	5U CIS-1,3-DICHLOROPROPENE 5U TRICHLOROETHENE(TRICHLOROETHYLENE)	
	100 CHLOROETHANE	5U TRICHLOROETHENE(TRICHLOROETHYLENE) 5U DIBROMOCHLOROMETHANE	
	40U METHYLENE CHLORIDE	5U 1,1,2-TRICHLOROETHANE	
	10U ACETONE	50 BENZENE	
	5U CARBON DISULFIDE	5U TRANS-1.3-DICHLOROPROPENE	
	5U 1,1-DICHLOROETHENE(1,1-DICHLOROETHYLENE)	5U BROMOFORM	
	5U 1.1-DICHLOROETHANE	10U METHYL ISOBUTYL KETONE	
	5U 1,1-DICHLOROETHANE 5U 1,2-DICHLOROETHENE (TOTAL)	100 METHYL BUTYL KETONE	
	5U CHLOROFORM	5U TETRACHLOROETHENE (TETRACHLOROETHYL	FNF)
	5U 1.2-DICHLOROETHANE	5U 1,1,2,2-TETRACHLOROETHANE	
1	OUR MÉTHYL ETHYL KETONE	SU TÓLÚENE	
	5U 1.1.1-TRICHLOROETHANE	5U CHLOROBENZENE	
	5U CARBON TETRACHLORIDE	SU ETHYL BENZENE	
	10U VINYL ACETATE	5U STYRENE	
	5U BROMODICHLOROMETHANE	5U TOTAL XYLENES	

REMARKS

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PURGEABLE ORGANICS DATA REPORT
PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/18/90 1020 STOP: 00/00/00
    PROJECT NO. 91-025 SAMPLE NO. 51663 SAMPLE TYPE: SOIL
**
                                                                                                                    * *
    SOURCE: AMAX PHOSPHATE FACIL
**
                                                                                                                    * *
* *
    STATION ID: SS-04
                                                                                                                    * *
**
                                                                                                                    **
                                          SAS NO.:
    CASE NO.: 15099
                                                               D. NO.: Y173
                                                                                                                    **
UG/KG
                     ANALYTICAL RESULTS
                                                              UG/KG
                                                                               ANALYTICAL RESULTS
    13U CHLOROMETHANE
                                                                7U 1.2-DICHLOROPROPANE
                                                                   CIS-1,3-DICHLOROPROPENE
TRICHLOROETHENE(TRICHLOROETHYLENE)
    130
        BROMOMETHANE
        VINYL CHLORIDE
    130
    13U CHLOROETHANE
                                                                    DIBROMOCHLOROMETHANE
        METHYLENE CHLORIDE
                                                                ŻŪ.
                                                                    1,1,2-TRICHLOROETHANE
    100
                                                                70 BÉNZENE
    130
        ACETONE
        CARBON DISULFIDE
                                                                    TRANS-1.3-DICHLOROPROPENE
                                                                7U
        1,1-DICHLOROETHENE(1,1-DICHLOROETHYLENE)
                                                                7U BROMOFORM
                                                                   METHYL ISOBUTYL KETONE
METHYL BUTYL KETONE
TETRACHLOROETHENE(TETRACHLOROETHYLENE)
        1,1-DICHLOROETHANE
       1,2-DICHLOROETHENE (TOTAL)
CHLOROFORM
     711
                                                                13Ú
        1.2-DICHLOROETHANE
                                                                7Ŭ
                                                                    1.1.2.2-TETRACHLOROETHANE
    13U METHYL ETHYL KETONE
                                                                    TÓLÚĒŃĒ
                                                                6J
     7Ü
        1.1.1-TRICHLOROETHANE
                                                                    CHLOROBENZENE
       CARBON TETRACHLORIDE
                                                                    ETHYL BENZENE
    13U VINYL ACETATE
                                                                    STYRENE
                                                                7U
     7U BROMODICHLOROMETHANE
                                                                7Ŭ
                                                                    TOTAL XYLENES
                                                                   PERCENT MOISTURE
```

REMARKS

FOOTNOTES

PURG	EABLE ORGANICS DATA REPORT		0.,0.,0.
***	* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * ***
* *	PROJECT NO. 91-025SAMPLE NO. 51664 SAMPLE TYPE: GROUNDWA	PROG ELEM: NSF COLLECTED BY: M GORDON	**
**	SOURCE: AMAX PHOSPHATE FACIL	CITY: PALMETTO ST: FL	**
**	STATION ID: TW-05	COLLECTION START: 10/18/90 0930 STOP:	00/00/00 **
**			**
**	CASE NO.: 15099 SAS NO.:	D. NO.: Y172	**
***	* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * ***
	UG/L ANALYTICAL RESULTS	UG/L ANALYTICAL RESULTS	
	10U CUI ODOMETUANE	FIL 4 O BIOULOBODDODANE	
	10U CHLOROMETHANE	5U 1,2-DICHLOROPROPANE	
	10U BROMOMETHANE 10U VINYL CHLORIDE	5U CIS-1,3-DICHLOROPROPENE	
		5U TRICHLOROETHENE (TRICHLOROETHYLENE)	
	10U CHLOROETHANE 70U METHYLENE CHLORIDE	5U DIBROMOCHLOROMETHANE 5U 1.1.2-TRICHLOROETHANE	
	20U ACETONE	5U 1.1.2-TRICHLOROETHANE 5U BENZENE	
	5U CARBON DISULFIDE	5U TRANS-1,3-DICHLOROPROPENE	
		50 TRANS-1,5-DICHEDROPROPENE 5U BROMOFORM	
	5U 1.1-DICHLOROETHENE(1.1-DICHLOROETHYLENE) 5U 1.1-DICHLOROETHANE	10U METHYL ISOBUTYL KETONE	
	5U 1.2-DICHLOROETHENE (TOTAL)	100 METHYL BUTYL KETONE	
	5U CHLOROFORM	5U TETRACHLOROETHENE (TETRACHLOROETHYL	FNF)
	5U 1,2-DICHLOROETHANE	5U 1,1,2,2-TETRACHLOROETHANE	ENE /
	10UR METHYL ETHYL KETONE	5U TOLUENE	
	5U 1,1,1-TRICHLOROETHANE	5U CHLOROBENZENE	
	5Ŭ CARBON TETRACHLORIDE	5U ETHYL BENZENE	
	10U VINYL ACETATE	5U STYRENE	
	5U BROMODICHLOROMETHANE	5U TOTAL XYLENES	

REMARKS

PURGEABLE ORGANICS DATA REPORT PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL PROJECT NO. 91-025 SAMPLE NO. 51665 SAMPLE TYPE: SOIL ** ** SOURCE: AMAX PHOSPHATE FACIL ** ** STATION ID: SB-05 COLLECTION START: 10/18/90 0910 STOP: 00/00/00 * * ** * * ** * * CASE NO.: 15099 SAS NO.: D. NO.: Y171 ** ANALYTICAL RESULTS UG/KG UG/KG ANALYTICAL RESULTS 6U 1,2-DICHLOROPROPANE 12U CHLOROMETHANE CIS-1,3-DICHLOROPROPENE TRICHLOROETHENE(TRICHLOROETHYLENE) BROMOMETHANE 120 60 VINYL CHLORIDE 120 60 CHLOROETHANE DIBROMOCHLOROMETHANE 120 6U METHYLENE CHLORIDE 1.1.2-TRICHLOROETHANE 6U 6U ACETONE BENZENE 200 6U CARBON DISULFIDE 6U 6Ü TRANS-1.3-DICHLOROPROPENE 1.1-DICHLOROETHENE(1.1-DICHLOROETHYLENE) 6U BROMOFORM 6U 1,1-DICHLOROETHANE METHYL ISOBUTYL KETONE METHYL BUTYL KETONE 120 6U 1,2-DICHLOROETHENE (TOTAL) 12U ĞŬ. CHLOROFORM TETRACHLOROETHENE (TETRACHLOROETHYLENE) 6U 1.2-DICHLOROETHANE METHYL ETHYL KETONE 60 6Ü 1,1,2,2-TETRACHLOROETHANE TOLUENE 120 ĞÜ. 1.1,1-TRICHLORGETHANE CHLOROBENZENE 6U 6U CARBON TETRACHLORIDE ETHYL BENZENE 6U 6Ü VINYL ACETATE STYRENE 120 6U 6U BROMODICHLOROMETHANE TOTAL XYLENES 6U PERCENT MOISTURE

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

01/04/91

PUR: *** ** ** **	GEABLE ORGANICS DATA REPORT * * * * * * * * * * * * * * * * * * *	CITY	G ELEM: NSF COLLECTED BY: M GORDON ** Y: PALMETTO ST: FL ** LECTION START: 10/18/90 0900 STOP: 00/00/00 **	*
**	CASE NO.: 15099 SAS N * * * * * * * * * * * * * * * * * * *	NO.: D. (* * * * * * * * * * * * * * * * * * *	NO.: Y170 ************************************	*
	12U CHLOROMETHANE 12U BROMOMETHANE 12U VINYL CHLORIDE 12U CHLOROETHANE 6U METHYLENE CHLORIDE 12U ACETONE 6U CARBON DISULFIDE 6U 1,1-DICHLOROETHENE(1,1-DICHLOROETHYLENE) 6U 1,1-DICHLOROETHANE 6U 1,2-DICHLOROETHENE (TOTAL) 6U CHLOROFORM 6U 1,2-DICHLOROETHANE 12U METHYL ETHYL KETONE 6U 1,1-TRICHLOROETHANE 6U 1,1-TRICHLOROETHANE 6U CARBON TETRACHLORIDE 12U VINYL ACETATE 6U BROMODICHLOROMETHANE	6U 6U 6U 6U 6U 12U 12U 6U 6U 6U 6U 6U 6U	CÎS-1,3-DÎCHLOROPROPENE TRICHLOROETHENE (TRICHLOROETHYLENE) DIBROMOCHLOROMETHANE U 1,1,2-TRICHLOROETHANE U 5ENZENE TRANS-1,3-DICHLOROPROPENE U METHYL ISOBUTYL KETONE U METHYL ISOBUTYL KETONE U METHYL BUTYL KETONE U TETRACHLOROETHENE (TETRACHLOROETHYLENE) U 1,1,2,2-TETRACHLOROETHANE U TOLUENE U CHLOROBENZENE U CHLOROBENZENE U TOTAL XYLENES	

REMARKS

REMARKS

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM

EPA-REGION IV ESD. ATHENS. GA. 01/04/91 PURGEABLE ORGANICS DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51667 SAMPLE TYPE: SOIL STATION ID: SS-07 PROG ELEM: NSF COLLECTED BY: M GORDON ** CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1150 STOP: 00/00/00 ** ** ** ** * * ** CASE NO.: 15099 SAS NO.: D. NO.: Y153 * * * * ANALYTICAL RESULTS UG/KG UG/KG ANALYTICAL RESULTS 12U CHLOROMETHANE 6U 1.2-DICHLOROPROPANE BROMOMETHANE 6U CIS-1,3-DICHLOROPROPENE 120 VINYL CHLORIDE CHLOROETHANE TRICHLOROETHENE (TRICHLOROETHYLENE) 6U 120 6U DIBROMOCHLOROMETHANE METHYLENE CHLORIDE 6U 6U 1.1.2-TRICHLOROETHANE BENZENE 12Ú ACETONE 6U TRANS-1,3-DICHLOROPROPENE BROMOFORM CARBON DISULFIDE
1,1-DICHLOROETHENE(1,1-DICHLOROETHYLENE) **6**U 6U 6U 1,1-DICHLOROETHANE METHYL ISOBUTYL KETONE METHYL BUTYL KETONE 120 1,2-DICHLOROETHENE (TOTAL) 12U 60 CHLOROFORM TETRACHLOROETHENE (TETRACHLOROETHYLENE) 6U

REMARKS

6U

6U

120

1,2-DICHLOROETHANE

1,1,1-TRICHLOROETHANE

12U MÉTHYL ETHYL KETONE

VINYL ACETATE

6U CARBON TETRACHLORIDE

6U BROMODICHLOROMETHANE

REMARKS

6U

6U

6U

6U

6U

6U

1,1,2,2-TETRACHLOROETHANE TOLUENE

CHLOROBENZENE

ETHYL BENZENE

TOTAL XYLENES

PERCENT MOISTURE

STYRENE

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM

01/04/91

DUDC	EARLE ODCANICS DATA REDORT	ESD, ATHENS, GA.	01/04/91
	EABLE ORGANICS DATA REPORT * * * * * * * * * * * * * * * * * * *		
**	PROJECT NO. 91-025 SAMPLE NO. 51668 SAMPLE TYPE: SOIL	PROG ELEM: NSF COLLECTED BY: M GORDON	**
**	SOURCE: AMAX PHOSPHATE FACIL	CITY: PALMETTO ST: FL	**
**	STATION ID: SS-06	COLLECTION START: 10/17/90 1205 STOP: 00/	
**	CASE NO . 15000	D NO - W150	**
**	CASE NO.: 15099 SAS NO.:	D. NO.: Y152	**
	UG/KG ANALYTICAL RESULTS	UG/KG ANALYTICAL RESULTS	
	13U CHLOROMETHANE	6U 1.2-DICHLOROPROPANE	
	13U BROMOMETHANE	6U CÍS-1,3-DICHLOROPROPENE	
	13U VINYL CHLORIDE	6U TRICHLOROETHENE (TRICHLOROETHYLENE)	
	13U CHLOROETHANE 6U METHYLENE CHLORIDE	6U DIBROMOCHLOROMETHANE 6U 1.1.2-TRICHLOROETHANE	
	13U ACETONE	6U 1.1.2-TRICHLOROETHANE 6U BENZENE	
	6U CARBON DISULFIDE	6U TRANS-1, 3-DICHLOROPROPENE	
	6U 1,1-DICHLOROETHENE(1,1-DICHLOROETHYLENE)	6U BROMOFORM	
	6U 1.1~DICHLOROETHANE	13U METHYL ISOBUTYL KETONE	
	6U 1,2~DICHLOROETHENE (TOTAL) 6U CHLOROFORM	13U METHYL BUTYL KETONE	
	6U CHLOROFORM 6U 1.2~DICHLOROETHANE	6U TETRACHLOROETHENE(TETRACHLOROETHYLENE) 6U 1.1.2.2-TETRACHLOROETHANE	
	13U METHYL ETHYL KETONE	1J TOLUENE	
	6U 1,1,1-TRICHLOROETHANE	6U CHLOROBENZÉNÉ	
	6U CARBON TETRACHLORIDE	6U ETHYL BENZENE	
	13U VINYL ACETATE	6U STYRENE	
	6U BROMODICHLOROMETHANE	6U TOTAL XYLENES 21 PERCENT MOISTURE	
		ZI FERGERI MOTOTORE	

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

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PURGEABLE ORGANICS DATA REPORT
PROG ELEM: NSF COLLECTED BY: M GORDON
                                                                CITY: PALMETTO ST: FL
COLLECTION START: 10/17/90 1230 STOP: 00/00/00
    SOURCE: AMAX PHOSPHATE FACIL
* *
                                                                                                                      * *
    STATION ID: SD-12
**
                                                                                                                      **
                                                                                                                      * *
    CASE NO.: 15099
                                           SAS NO.:
**
                                                                 D. NO.: Y154
                                                                                                                      **
UG/KG
                      ANALYTICAL RESULTS
                                                               UG/KG
                                                                                 ANALYTICAL RESULTS
                                                                  7U 1,2-DICHLOROPROPANE
7U CIS-1,3-DICHLOROPROPENE
7U TRICHLOROETHENE(TRICHLOROETHYLENE)
    150
        CHLOROMETHANE
         BROMOME THANE
    15U
         VINYL CHLORIDE
    150
        CHLOROETHANE
    150
                                                                     DIBROMOCHLOROMETHANE
     ŽŪ.
        METHYLENE CHLORIDE
                                                                     1.1.2-TRICHLOROETHANE
                                                                     BÉNZENE
    20U
        ACETONE
                                                                  7U
     7Ŭ
         CARBON DISULFIDE
                                                                     TRANS-1.3-DICHLOROPROPENE
                                                                  7Ú
         1,1-DICHLOROETHENE(1.1-DICHLOROETHYLENE)
                                                                  7Ú
                                                                     BROMOFORM
                                                                     METHYL ISOBUTYL KETONE
METHYL BUTYL KETONE
TETRACHLOROETHENE(TETRACHLOROETHYLENE)
1,1,2,2-TETRACHLOROETHANE
TOLUENE
         1,1-DICHLOROETHANE
                                                                 150
        1,2-DICHLOROETHENE (TOTAL)
CHLOROFORM
                                                                 15U
                                                                  ŹU
         1.2-DICHLOROETHANE
                                                                  7Ũ
        METHYL ETHYL KETONE
    15U
                                                                  7Ū
         1.1.1-TRICHLORGETHANE
                                                                  711
                                                                     CHLOROBENZENE
         CARBON TETRACHLORIDE
                                                                  7U
                                                                     ETHYL BENZENE
    150
        VINYL ACETATE
                                                                     STYRENE
                                                                  711
         BROMODICHLOROMETHANE
                                                                     TOTAL XYLENES
                                                                  7U
                                                                     PERCENT MOISTURE
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REMARKS

01/04/91

PURGEABLE ORGANICS DATA REPORT	ELA REGION IV ESS, ATTENS, GA.	01/04/91
*** * * * * * * * * * * * * * * * * * *		
** PROJECT NO. 91-025 SAMPLE NO. 51670 SAMPLE	TYPE: PROG ELEM: NSF COLLECTED BY: M GORDON	**
** SOURCE:	CITY: PALMETTOST:_FL	**
** STATION ID: SB-06	COLLECTION START: 10/17/90 1215 STOP: 00/0	
**	NO . D. NO . V455	**
-+- CM3L NO., 13033	NO.: D. NO.: Y155	** *** * * * * * * *
UG/KG ANALYTICAL RESULTS	UG/KG ANALYTICAL RESULTS	
12U CHLOROMETHANE	6U 1.2-DICHLOROPROPANE	
12U BROMOMETHANE	6U CIS-1,3-DICHLOROPROPENE	
12U VINYL CHLORIDE	6U TRÍCHLÓRÓETHENE (TRÍCHLÓROETHYLENE)	
12U CHLOROETHANE	6U DIBROMOCHLOROMETHANE	
20U METHYLENE CHLORIDE	6U 1.1.2-TRICHLOROETHANE	
12U ACETONE	6U BENZENE	
6U CARBON DISULFIDE	6U TRANS-1,3-DICHLOROPROPENE	
6U 1,1-DICHLOROETHENE(1,1-DICHLOROETHYLENE) 6U 1,1-DICHLOROETHANE	6U BROMOFORM 12U METHYL ISOBUTYL KETONE	
6U 1,2-DICHLOROETHENE (TOTAL)	12U METHYL ISOBUTYL KETONE 12U METHYL BUTYL KETONE	
6U CHLOROFORM	6U TETRACHLOROETHENE (TETRACHLOROETHYLENE)	
6U CHLOROFORM 6U 1,2-DICHLOROETHANE	6U 1,1,2,2-TETRACHLOROETHANE	
12U METHYL ETHYL KETONE	3J TÓLÚĒŃĒ	
6U 1,1,1-TRICHLOROETHANE	6Ú CHĽÓŘOBENZENE	
6U CARBON TETRACHLORIDE	6U ETHYL BENZENE	
12U VINYL ACETATE	6U STYRENE	
6U BROMODICHLOROMETHANE	6U TOTAL XYLENES	
	16 PERCENT MOISTURE	

REMARKS

REMARKS

01/04/91

PURGEABLE O	RGANICS DATA REPORT	ETA REGION IV	ESD, ATTIENS, GA.	01/04/91
*** * * * * ** PROJEC ** SOURCE	* * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * *		GORDON ** FL **
** CASE N	0.: 15099	SAS NO.:	D. NO.: Y149	**
***	ANALYTICAL RE		UG/KG ANALYTICAL RE	* * * * * * * * * * * * * * * * * * *
12U B 12U C 12U C 12U A 12U A 16U 1 6U 1 12U M 6U 1 12U M 12U C 12U C	HLOROMETHANE ROMOMETHANE INYL CHLORIDE HLOROETHANE ETHYLENE CHLORIDE CETONE ARBON DISULFIDE ,1-DICHLOROETHANE ,2-DICHLOROETHANE ,2-DICHLOROETHENE (TOTAL) HLOROFORM ,2-DICHLOROETHANE ETHYL ETHYL KETONE ,1.1-TRICHLOROETHANE ARBON TETRACHLORIDE INYL ACETATE ROMODICHLOROMETHANE	ILOROETHYLENE)	6U 1,2-DICHLOROPROPANE 6U CIS-1,3-DICHLOROPROPENE 6U TRICHLOROETHENE (TRICHLOROE 6U DIBROMOCHLOROMETHANE 6U 1,1,2-TRICHLOROETHANE 6U BENZENE 6U TRANS-1,3-DICHLOROPROPENE 6U BROMOFORM 12U METHYL ISOBUTYL KETONE 12U METHYL BUTYL KETONE 6U TETRACHLOROETHENE (TETRACHLOROETHANE 6U TOLUENE 6U TOLUENE 6U CHLOROBENZENE 6U CHLOROBENZENE 6U STYRENE 6U TOTAL XYLENES 19 PERCENT MOISTURE	ŕ

REMARKS

REMARKS

01/04/91

PURGEABLE ORGANICS DATA REPORT	ios, mileto, an	01,01,01
*** * * * * * * * * * * * * * * * * *	PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL	* * * * * * * * * * * * * * * * * * *
** CASE NO.: 15099	D. NO.: Y151 * * * * * * * * * * * * * * * * * * *	** ** * * * * * * * * ***
10U CHLOROMETHANE 10U BROMOMETHANE 10U VINYL CHLORIDE 10U CHLOROETHANE 5U METHYLENE CHLORIDE 10U ACETONE 5U CARBON DISULFIDE 5U 1,1-DICHLOROETHENE(1,1-DICHLOROETHYLENE) 5U 1,1-DICHLOROETHENE (TOTAL) 5U 1,2-DICHLOROETHENE (TOTAL) 5U CHLOROFORM 5U 1,2-DICHLOROETHANE 10U METHYL ETHYL KETONE 5U 1,1-TRICHLOROETHANE 5U CARBON TETRACHLORIDE 10U VINYL ACETATE 5U BROMODICHLOROMETHANE	5U 1,2-DICHLOROPROPANE 5U CIS-1,3-DICHLOROPROPENE 5U TRICHLOROETHENE(TRICHLOROETHYLENE) 5U DIBROMOCHLOROMETHANE 5U 1,1,2-TRICHLOROETHANE 5U BENZENE 5U TRANS-1,3-DICHLOROPROPENE 5U BROMOFORM 10U METHYL ISOBUTYL KETONE 10U METHYL BUTYL KETONE 5U TETRACHLOROETHENE(TETRACHLOROETHYLE 5U TETRACHLOROETHENE(TETRACHLOROETHYLE 5U TOLUENE 5U CHLOROBENZENE 5U ETHYL BENZENE 5U STYRENE 5U TOTAL XYLENES	ENE)

REMARKS

REMARKS

FOOTNOTES

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PURGEABLE ORGANICS DATA REPORT
*** PROJECT NO. 91-025 SAMPLE NO. 51673 SAMPLE TYPE: GROUNDWA

** SOURCE: AMAX PHOSPHATE FACIL

** STATION ID: MW-01

** COLLECTION START: 10/16/90 1130 STOP: 00/00/00

**
**
                                                                                                                                **
     CASE NO.: 15099
                                               SAS NO.:
                                                                      D. NO.: Y326
**
                                                                                                                                **
   ANALYTICAL RESULTS
                                                                     UG/L
                                                                                        ANALYTICAL RESULTS
     100
         CHLOROMETHANE
                                                                       5U 1,2-DICHLOROPROPANE
                                                                           CÍS-1,3-DICHLOROPROPENE
TRICHLOROETHENE(TRICHLOROETHYLENE)
     100
         BROMOMETHANE
                                                                        5Ú
          VINYL CHLORIDE
                                                                        5ŭ
     100
     100 CHLOROETHANE
                                                                        5Ŭ
                                                                           DIBROMOCHLOROMETHANE
         METHYLENE CHLORIDE
                                                                       5U
                                                                           1,1,2-TRICHLOROETHANE
      5U
     100
         ACETONE
                                                                       5Ü
                                                                           BENZENE
                                                                       5ŭ
          CARBON DISULFIDE
                                                                           TRANS-1.3-DICHLOROPROPENE
                                                                       50 BROMOFORM
          1,1-DICHLOROETHENE(1,1-DICHLOROETHYLENE)
         1,1-DICHLOROETHANE
                                                                           METHYL ISOBUTYL KETONE METHYL BUTYL KETONE
                                                                       10Ú
         1.2-DICHLOROETHENE (TOTAL)
      ŚÚ.
                                                                       100
                                                                           TETRACHLOROETHENE (TETRACHLOROETHYLENE)
1,1,2,2-TETRACHLOROETHANE
TOLUENE
      5U
                                                                       5U
          1,2-DICHLOROETHANE
                                                                       5Ŭ
     100 MÉTHYL ETHYL KETONE
                                                                       5Ŭ
      50
          1.1.1-TRICHLOROETHANE
                                                                       50
                                                                           CHLOROBENZENE
      5U
         CARBON TETRACHLORIDE
                                                                       5U
                                                                           ETHYL BENZENE
                                                                           STYRENE
     10U VINYL ACETATE
      5U BROMODICHLOROMETHANE
                                                                           TOTAL XYLENES
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REMARKS

01/04/91

PURGEABLE ORGANICS DATA REPORT	ESD, ATTENS, GA.	01/04/31
*** * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * * *	
** PROJECT NO. 91-025 SAMPLE NO. 51674 SAMPLE TYPE: SURFACEWA	A PROG ELEM: NSF COLLECTED BY: M GORDON	**
** SOURCE: AMAX PHOSPHATE FACIL	CITY: PALMETTO ST: FL	**
** STATION ID: SW-01	COLLECTION START: 10/16/90 1330 STOP: 00/0	
**	D NO : V407	**
** CASE NO.: 15099 SAS NO.:	U. NU.: Y13/	**
UG/L ANALYTICAL RESULTS	UG/L ANALYTICAL RESULTS	
ANALYTONE RESULTS	OU/E ANALTITCAL RESOLTS	
10U CHLOROMETHANE	5U 1,2-DICHLOROPROPANE	
10U BROMOMETHANE	5U CIS-1,3-DICHLOROPROPENE	
10U VINYL CHLORIDE	5U TRICHLOROETHENE(TRICHLOROETHYLENE)	
10U CHLOROETHANE	5U DIBROMOCHLOROMETHANE	
5U METHYLENE CHLORIDE	5U 1,1,2-TRICHLOROETHANE	
10U ACETONE	5U BENZENE	
5U CARBON DISULFIDE 5U 1,1-DICHLOROETHENE(1,1-DICHLOROETHYLENE)	5U TRANS-1,3-DICHLOROPROPENE 5U BROMOFORM	
5U 1,1-DICHLOROETHANE	10U METHYL ISOBUTYL KETONE	
5U 1,2-DICHLOROETHENE (TOTAL)	10U METHYL BUTYL KETONE	
5U 1.2-DICHLOROETHENE (TOTAL) 5U CHLOROFORM	5U TETRACHLOROETHENE (TETRACHLOROETHYLENE)	
5U 1.2-DICHLOROETHANE	5U 1,1,2,2-TETRACHLOROETHANE	
10U MÉTHYL ETHYL KETONE	5U TOLUENE	
5U 1,1,1-TRICHLOROETHANE	5U CHLOROBENZENE	
5U CARBON TETRACHLORIDE	5U ETHYL BENZENE	
10U VINYL ACETATE	5U STYRENE	
5U BROMODICHLOROMETHANE	5U TOTAL XYLENES	

REMARKS

REMARKS

PHR	GEABLE ORGANICS DATA REPORT	LSD, ATRENS, GA.	01/04/91
	* * * * * * * * * * * * * * * * * * * *		* * * * * * * ***
**	PROJECT NO. 91-025 SAMPLE NO. 51675 SAMPLE TYPE: SOIL	PROG ELEM: NSF COLLECTED BY: M GORDON	**]
**	SOURCE: AMAX PHOSPHATE FACIL	CITY: PALMETTO ST: FL	**
**	STATION ID: SD-01	COLLECTION START: 10/16/90 1335 STOP: 00/0	
**	045F NO - 45000	D NO . MAGG	**
**	CASE NO.: 15099 SAS NO.:	U. NU.: Y136	**
***	UG/KG ANALYTICAL RESULTS	UG/KG ANALYTICAL RESULTS	• • • • • • • • • • • • • • • • • • • •
	13U CHLOROMETHANE	6U 1.2-DICHLOROPROPANE	
	13U BROMOMETHANE	6U CIS-1,3-DICHLOROPROPENE	
	13U VINYL_CHLORIDE	6U TRICHLOROETHENE(TRICHLOROETHYLENE)	
	13U CHLOROETHANE	6U DIBROMOCHLOROMETHANE	
	6U METHYLENE CHLORIDE 13U ACETONE	6U 1,1,2-TRICHLOROETHANE	
	6U CARBON DISULFIDE	6U BENZENE 6U TRANS-1,3-DICHLOROPROPENE	
	6U 1,1-DICHLOROETHENE(1,1-DICHLOROETHYLENE)	6U BROMOFORM	
	6U 1,1-DICHLOROETHANE	13U METHYL ISOBUTYL KETONE	
	6U 1,2-DICHLOROETHENE (TOTAL)	13U METHYL BUTYL KETONE	
	6U CHLOROFORM	6U TETRACHLOROETHENE (TETRACHLOROETHYLENE)	
	6U 1,2-DICHLOROETHANE	6U 1,1,2,2-TETRACHLOROETHANE	
	13U METHYL ETHYL KETONE 6U 1,1,1-TRICHLOROETHANE	6U TOLUENE 6U CHLOROBENZENE	
	6U CARBON TETRACHLORIDE	6U CHLOROBENZENE 6U ETHYL BENZENE	
	13U VINYL ACETATE	6U STYRENE	
	6U BROMODICHLOROMETHANE	6U TOTAL XYLENES	
		21 PERCENT MOISTURE	

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

DIIR	GEABLE ORGANICS DATA REPORT	LPA-REGION IV ESD, ATTENS, GA.			
*** ** **	PROJECT NO. 91-025 SAMPLE NO. 51676 SAMPLE TYPE: GROUNDWA SOURCE: AMAX PHOSPHATE FACIL STATION ID: MW-05	PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/16/90 1350 STOP: 00/00/	**		
**	CASE NO.: 15099 SAS NO.:	D. NO.: Y329	**		
***	* * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * *	* * * * * ***		
	10U CHLOROMETHANE 10U BROMOMETHANE 10U VINYL CHLORIDE 10U CHLOROETHANE 8U METHYLENE CHLORIDE 10U ACETONE 5U CARBON DISULFIDE 5U 1.1-DICHLOROETHENE(1.1-DICHLOROETHYLENE) 5U 1.1-DICHLOROETHANE 5U 1.2-DICHLOROETHENE (TOTAL) 5U CHLOROFORM 5U 1.2-DICHLOROETHANE 10UR METHYL ETHYL KETONE 5U 1.1-TRICHLOROETHANE 5U 1.1-TRICHLOROETHANE 5U CARBON TETRACHLORIDE 10U VINYL ACETATE 5U BROMODICHLOROMETHANE	5U 1,2-DICHLOROPROPANE 5U CIS-1,3-DICHLOROPROPENE 5U TRICHLOROETHENE (TRICHLOROETHYLENE) 5U DIBROMOCHLOROMETHANE 5U 1,1,2-TRICHLOROETHANE 5U BENZENE 5U TRANS-1,3-DICHLOROPROPENE 5U BROMOFORM 10U METHYL ISOBUTYL KETONE 10U METHYL BUTYL KETONE 5U TETRACHLOROETHENE (TETRACHLOROETHYLENE) 5U 1,1,2,2-TETRACHLOROETHANE 5U TOLUENE 5U CHLOROBENZENE 5U STYRENE 5U STYRENE 5U TOTAL XYLENES			

REMARKS

FOOTNOTES

PURGEABLE ORGANICS DATA REPORT	The Action 11 200, Amend, GA.	01/04/01
*** * * * * * * * * * * * * * * * * * *	AMPLE TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDO ST: FL COLLECTION START: 10/16/90 1415 STO	**
** CASE NO.: 15099	SAS NO.: D. NO.: Y141	**
UG/L ANALYTICAL RESULTS	UG/L ANALYTICAL RESULTS	* * * * * * * * * * * * * * * * * * * *
10U CHLOROMETHANE 10U BROMOMETHANE 10U VINYL CHLORIDE 10U CHLOROETHANE 20U METHYLENE CHLORIDE 20U ACETONE 5U CARBON DISULFIDE 5U 1,1-DICHLOROETHENE(1,1-DICHLOROETHYL 5U 1,2-DICHLOROETHANE 5U 1,2-DICHLOROETHANE 5U 1,2-DICHLOROETHANE 10U METHYL ETHYL KETONE 5U 1,1-TRICHLOROETHANE 10U METHYL ETHYL KETONE 5U 1,1-TRICHLOROETHANE 5U CARBON TETRACHLORIDE 10U VINYL ACETATE 5U BROMODICHLOROMETHANE	5U 1,2-DICHLOROPROPANE 5U CIS-1,3-DICHLOROPROPENE 5U TRICHLOROETHENE (TRICHLOROETHYLEN 5U DIBROMOCHLOROMETHANE 5U 1,1,2-TRICHLOROETHANE 5U BENZENE 5U TRANS-1,3-DICHLOROPROPENE ENE) 5U BROMOFORM 10U METHYL ISOBUTYL KETONE 10U METHYL BUTYL KETONE 10U METHYL BUTYL KETONE 5U TETRACHLOROETHENE (TETRACHLOROETH 5U 1,1,2,2-TETRACHLOROETHANE 5U TOLUENE 5U CHLOROBENZENE 5U CHLOROBENZENE 5U STYRENE 5U TOTAL XYLENES	

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

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PURGEABLE ORGANICS DATA REPORT
PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/16/90 1420 STOP: 00/00/00
    PROJECT NO. 91-025 SAMPLE NO. 51678 SAMPLE TYPE: SOIL
* *
                                                                                                                        * *
    SOURCE: AMAX PHOSPHATE FACIL
**
                                                                                                                        * *
* *
    STATION ID: SD-02
                                                                                                                        **
**
                                                                                                                        **
    CASE NO.: 15099
                                           SAS NO.:
                                                                  D. NO.: Y140
                                                                                                                        * *
UG/KG
                      ANALYTICAL RESULTS
                                                                UG/KG
                                                                                   ANALYTICAL RESULTS
                                                                  16U 1.2-DICHLOROPROPANE
16U CIS-1.3-DICHLOROPROPENE
16U TRICHLOROETHENE(TRICHLOROETHYLENE)
    31U CHLOROMETHANE
    31Ü
         BROMOMETHANE
         VINYL CHLORIDE
    310
         CHLOROETHANE
                                                                      DIBROMOCHLOROMETHANE
    310
                                                                  160
         METHYLENE CHLORIDE
    160
                                                                  16U 1.1.2-TRICHLOROETHANE
         ACETONE
                                                                       BENZENE
    3111
                                                                  160
         CARBON DISULFIDE
                                                                  16U TRANS-1,3-DICHLOROPROPENE
    10J
         1,1-DICHLOROETHENE(1,1-DICHLOROETHYLENE)
                                                                  16U BROMOFORM
    16U
        1,1-DICHLOROETHANE
                                                                      METHYL ISOBUTYL KETONE
    160
                                                                  310
                                                                      METHYL BUTYL KETONE
METHYL BUTYL KETONE
TETRACHLOROETHENE(TETRACHLOROETHYLENE)
1,1,2,2-TETRACHLOROETHANE
TOLUENE
    160
         1,2-DICHLOROETHENE (TOTAL)
                                                                  310
    160 CHLOROFORM
                                                                  16U
         1.2-DICHLOROETHANE
    160
                                                                  160
    31U MÉTHYL ETHYL KETONE
                                                                  160
    16Ú
         1.1.1-TRICHLOROETHANE
                                                                  160
                                                                       CHLOROBENZENE
         CÁRBON TETRACHLORIDE
                                                                       ETHYL BENZENE
    160
                                                                  16U
         VINYL ACETATE
    310
                                                                  16U
                                                                      STYRENE
    16U BROMODICHLOROMETHANE
                                                                  16U TOTAL XYLENES
                                                                   68 PERCENT MOISTURE
```

REMARKS

FOOTNOTES *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *A-AVERAGE VALUE *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN *NATIVE THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

01/04/91 PURGEARIE ORGANICS DATA REPORT

	LE ORGANICS DATA						
** S0	OJECT NO. 91-025 URCE: AMAX PHOSPI ATION ID: MW-04	SAMPLE NO. 51	* * * * * * * * * * * * * * * * * * *	UNDWA PROG CITY:	ELEM: NSF COLLECTED PALMETTO CTION START: 10/16/90	BY: M GORDON ST: FL 1520 STOP: 00/	/00/00 ** **
** CA	SE NO.: 15099 * * * * * * * * L	* * * * * * * * ANALYTICAL RESUL	SAS NO.: * * * * * * * * * * TS	D. N * * * * * * * UG/L		* * * * * * * * AL RESULTS	* * * * * * * * ***
100 100 100 100 100 100 100 100 100 100	U BROMOMETHANE U VINYL CHLORIDI U CHLOROETHANE U METHYLENE CHLO U ACETONE U CARBON DISULF U 1,1-DICHLOROE U 1,2-DICHLOROE U CHLOROFORM U 1,2-DICHLOROE R METHYL ETHYL I U 1,1-TRICHLOI U CARBON TETRACI U VINYL ACETATE	ORIDE (DE (HENE(1,1-DICHLOR HANE (HENE (TOTAL) (HANE (ETONE ROETHANE HLORIDE	OETHYLENE)	50000000000000000000000000000000000000	1,2-DICHLOROPROPANE CIS-1,3-DICHLOROPROPE TRICHLOROETHENE(TRICH DIBROMOCHLOROMETHANE 1,1,2-TRICHLOROETHANE BENZENE TRANS-1,3-DICHLOROPRO BROMOFORM METHYL ISOBUTYL KETON METHYL BUTYL KETON TETRACHLOROETHENE(TET 1,1,2,2-TETRACHLOROET TOLUENE CHLOROBENZENE ETHYL BENZENE STYRENE TOTAL XYLENES	LOROETHYLENE) PENE E RACHLOROETHYLENE)	ı

REMARKS

FOOTNOTES

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

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PURGEABLE ORGANICS DATA REPORT
PROJECT NO. 91-025 SAMPLE NO. 51680 SAMPLE TYPE: SOIL SOURCE: AMAX PHOSPHATE FACIL
                                                             PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/16/90 1520 STOP: 00/00/00
**
**
                                                                                                                  **
**
    STATION ID: SS-01
                                                                                                                  * *
**
                                                                                                                  **
    CASE NO.: 15099
**
                                         SAS NO.:
                                                              D. NO.: Y138
                                                                                                                  * *
ANALYTICAL RESULTS
   UG/KG
                                                             UG/KG
                                                                              ANALYTICAL RESULTS
                                                                7U 1,2-DICHLOROPROPANE
    14U CHLOROMETHANE
    140
       BROMOMETHANE
                                                                   CIS-1,3-DICHLOROPROPENE
    14U VINYL CHLORIDE
                                                                   TRICHLOROETHENE (TRICHLOROETHYLENE)
    14U CHLOROETHANE
                                                                   DIBROMOCHLOROMETHANE
                                                               7U
        METHYLENE CHLORIDE
     7U
                                                                7U
                                                                   1,1,2-TRICHLOROETHANE
    14U
        ACETONE
                                                               7Ü
                                                                   BENZENE
        CARBON DISULFIDE
     7Ú
                                                                   TRANS-1,3-DICHLOROPROPENE
                                                               7U
        1,1-DICHLOROETHENE(1,1-DICHLOROETHYLENE)
                                                                   BROMOFORM
                                                               7U
        1,1-DICHLOROETHANE
                                                                   METHYL ISOBUTYL KETONE
METHYL BUTYL KETONE
                                                               140
       1,2-DICHLOROETHENE (TOTAL)
CHLOROFORM
                                                               140
                                                                7U
                                                                   TETRACHLOROETHENE (TETRACHLOROETHYLENE)
                                                                   1,1,2,2-TETRACHLOROETHANE
TOLUENE
        1,2-DICHLOROETHANE
                                                               7U
    140 MÉTHYL ETHYL KETONE
                                                               2Ĵ
       1.1.1-TRICHLOROETHANE
                                                               7Ù
                                                                   CHLOROBENZENE
       CARBON TETRACHLORIDE
                                                               7U
                                                                   ETHYL BENZENE
    14U VINYL ACETATE
                                                               7U
                                                                   STYRENE
     7U BROMODICHLOROMETHANE
                                                                   TOTAL XYLENES
                                                               7U
                                                                  PERCENT MOISTURE
```

REMARKS

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PURGEABLE ORGANICS DATA REPORT		FEDD, ATTIENES, GR.	01/04/31
*** * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * *	PROG ELEM: NSF COLLECTED BY: M GC CITY: PALMETTO ST: FL COLLECTION START: 10/16/90 1535	ORDON **
**	SAS NO.: * * * * * * * * * * * * * * * * * * *	D. NO.: Y139 * * * * * * * * * * * * * * * * * * *	**
12U CHLOROMETHANE 12U BROMOMETHANE 12U VINYL CHLORIDE 12U CHLOROETHANE 7U METHYLENE CHLORIDE 12U ACETONE 6U CARBON DISULFIDE 6U 1,1-DICHLOROETHANE 6U 1,2-DICHLOROETHANE 6U CHLOROFORM 6U 1,2-DICHLOROETHANE 12U METHYL ETHYL KETONE 6U 1,1-TRICHLOROETHAN 6U CARBON TETRACHLORIDE 12U VINYL ACETATE 6U BROMODICHLOROMETHANE	NE E	6U 1,2-DICHLOROPROPANE 6U CIS-1,3-DICHLOROPROPENE 6U TRICHLOROETHENE (TRICHLOROETHY 6U DIBROMOCHLOROMETHANE 6U BENZENE 6U TRANS-1,3-DICHLOROPROPENE 6U BROMOFORM 12U METHYL ISOBUTYL KETONE 12U METHYL BUTYL KETONE 6U TETRACHLOROETHENE (TETRACHLOROETHENE) 6U TOLUENE 6U CHLOROBENZENE 6U CHLOROBENZENE 6U ETHYL BENZENE 6U STYRENE 6U TOTAL XYLENES 18 PERCENT MOISTURE	

REMARKS

01/04/91

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PURG	EABLE ORGANICS DATA REPORT	REGION IN ESD, ATTIENS, GA.	01/04/31
*** ** ** **	* * * * * * * * * * * * * * * * * * *	E: GROUNDWA PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/16/90 1615 STOP: OF	**
	CASE NO.: 15099 SAS NO.:	D. NO.: Y143	
***	* * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * *	* * * * * * * * * ***
	10U CHLOROMETHANE 10U BROMOMETHANE 10U VINYL CHLORIDE 10U CHLOROETHANE 5U METHYLENE CHLORIDE 50U ACETONE 130 CARBON DISULFIDE 5U 1,1-DICHLOROETHENE(1,1-DICHLOROETHYLENE) 5U 1,1-DICHLOROETHANE 5U 1,2-DICHLOROETHENE (TOTAL) 5U CHLOROFORM 5U 1,2-DICHLOROETHANE 10UR METHYL ETHYL KETONE 5U 1,1-TRICHLOROETHANE 5U CARBON TETRACHLORIDE 10U VINYL ACETATE 5U BROMODICHLOROMETHANE	5U 1,2-DICHLOROPROPANE 5U CIS-1,3-DICHLOROPROPENE 5U TRICHLOROETHENE(TRICHLOROETHYLENE) 5U DIBROMOCHLOROMETHANE 5U 1,1,2-TRICHLOROETHANE 5U BENZENE 5U TRANS-1,3-DICHLOROPROPENE 5U BROMOFORM 10U METHYL ISOBUTYL KETONE 10U METHYL BUTYL KETONE 5U TETRACHLOROETHENE(TETRACHLOROETHYLEN) 5U 1,1,2,2-TETRACHLOROETHANE 5U TOLUENE 5U CHLOROBENZENE 5U STYRENE 5U STYRENE 5U TOTAL XYLENES	E)

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
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01/04/91

PURGEAB	LE ORGANICS DATA	REPORT				,					.,.	., .
** S0	* * * * * * * * * * * * * * * * * * *	* * * * * * SAMPLE N HATE FACIL	* * * * * * * O. 51683 SAMP			PROG CITY:	ELEM: NSF PALMETTO	COLLECTED	BY: M GORDON ST: FL 1625 STOP			***
	SE NO.: 15099 * * * * * * * * L	* * * * * * * * * * * * * * * * * * *		5 NO.: * * * *	* * * * *	D. N * * * * UG/L	0.: Y142 * * * * *	* * * * * * ANALYTIC	* * * * * * AL RESULTS	* * * * *	* * * *	**
100 100 106 105 55 55 55 50 55 105	BROMOMETHANE U VINYL CHLORID U CHLOROETHANE U CHLOROETHANE U ACETONE U CARBON DISULF U 1,1-DICHLOROE U 1,2-DICHLOROE U CHLOROFORM U 1,2-DICHLOROE U 1,2-DICHLOROE U CHLOROFORM U 1,2-DICHLOROE U METHYL ETHYL U 1,1,1-TRICHLO U CARBON TETRAC U VINYL ACETATE	E ORIDE IDE THENE(1,1-DI THANE THENE (TOTAL THANE KETONE ROETHANE HLORIDE	CHLOROETHYLENE))		ນນນນນນນນນນນນນນນນນນນ ສິດສິນສິນສິນສິນສິນສິນສິນສິນສິນສິນສິນສິນສິນສ	TRÍCHLORÓE DIBROMOCHL 1,1,2-TRIC BENZENE TRANS-1,3- BROMOFORM METHYL ISC METHYL BUT TETRACHLOR	CHLOROPROPE THENE (TRICH OROMETHANE CHLOROETHANE DICHLOROPRO BUTYL KETONE VL KETONE COETHENE (TET TRACHLOROET	ILOROETHYLENE PENE IE RACHLOROETHY			

REMARKS

REMARKS

FOOTNOTES

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM

EPA-REGION IV ESD. ATHENS. GA. 01/04/91

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PURGEABLE ORGANICS DATA REPORT
PROJECT NO. 91-025 SAMPLE NO. 51684 SAMPLE TYPE: GROUNDWA
                                                             PROG ELEM: NSF COLLECTED BY: M GORDON
* *
                                                                                                                 **
    SOURCE: AMAX PHOSPHATE FACIL
                                                             CITY: PALMETTO ST: FL
COLLECTION START: 10/17/90 0935 STOP: 00/00/00
* *
                                                                                                                 * *
**
    STATION ID: PW-01
                                                                                                                 **
**
                                                                                                                 * *
    CASE NO.: 15099
                                         SAS NO.:
                                                              D. NO.: Y147
                                                                                                                 **
   UG/L
                     ANALYTICAL RESULTS
                                                            UG/L
                                                                              ANALYTICAL RESULTS
    10U CHLOROMETHANE
                                                               5U 1,2-DICHLOROPROPANE
                                                                  CÍS-1,3-DICHLOROPROPENE
TRICHLOROETHENE (TRICHLOROETHYLENE)
    100
        BROMOMETHANE
                                                               5Ú
    100 VINYL CHLORIDE
100 CHLOROETHANE
                                                               ŠŬ.
                                                               ŠŬ.
                                                                  DIBROMOCHLOROMETHANE
        METHYLENE CHLORIDE
                                                                  1.1.2-TRICHLOROETHANE
     5U
                                                               5U
    100
        ACETONE
                                                               5Ü
                                                                  BENZENE
        CARBON DISULFIDE
                                                                  TRANS-1,3-DICHLOROPROPENE
                                                               50 BROMOFORM
        1,1-DICHLOROETHENE(1,1-DICHLOROETHYLENE)
                                                              100 METHYL ISOBUTYL KETONE
100 METHYL BUTYL KETONE
        1,1-DICHLOROETHANE
     5U
        1,2-DICHLOROETHENE (TOTAL)
     5U
        CHLOROFORM
                                                               5U
                                                                  TETRACHLOROETHENE (TETRACHLOROETHYLENE)
                                                                  1,1,2,2-TETRACHLOROETHANE
TOLUENE
        1,2-DICHLOROETHANE
                                                               ŠŬ.
    100 METHYL ETHYL KETONE
                                                               ŠŬ.
     5U
        1.1.1-TRICHLOROETHANE
                                                               5Ú
                                                                  CHLOROBENZENE
        CARBON TETRACHLORIDE
                                                               50
                                                                  ETHYL BENZENE
        VINYL ACETATE
                                                                  STYRENE
     5U BROMODICHLOROMETHANE
                                                                  TOTAL XYLENES
```

REMARKS ***REMARKS***

FOOTNOTES

*A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

^{*}R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

DUDGE	ABLE ORGANICS DATA	DEDODT	EPA-REGION I	V CSD, AIR	ENS, GA.		01/04/91
		* * * * * * * * *	* * * * * * * * * * * * * * * * * * *	* * * * * *	* * * * * * * ELEM: NSF	COLLECTED BY: M GORD	
**	SOURCE: AMAX PHOSPI STATION ID: SS-02	ATE FACIL	SAMPLE TIPE: SOIL	CITY	: PALMETTO ECTION START:	ST: FL	** OP: 00/00/00 **
** ** *** *	CASE NO.: 15099	* * * * * * * * * * * * * * ANALYTICAL RESULTS	SAS NO.:		NO.: Y144	* * * * * * * * * * * * * * * * * * *	**
	11U CHLOROMETHANE 11U BROMOMETHANE 11U VINYL CHLORIDE 11U CHLOROETHANE 5U METHYLENE CHLOR 11U ACETONE 5U 1,1-DICHLOROET 5U 1,1-DICHLOROET 5U 1,2-DICHLOROET 5U 1,2-DICHLOROET 5U 1,2-DICHLOROET 11U METHYL ETHYL K 5U 1,1-TRICHLOR 5U 1,1-TRICHLOR 5U 1,1-TRICHLOR 5U 1,1-TRICHLOR 5U 1,1-TRICHLOR 5U 1,1-TRICHLOR 5U 1,1,1-TRICHLOR 5U CARBON TETRACH 11U VINYL ACETATE 5U BROMODICHLOROM	ORIDE DE HENE(1,1-DICHLOROET HANE HENE (TOTAL) THANE ETONE KOETHANE ILORIDE	HYLENE)	55000000000000000000000000000000000000	CÍS-1,3-DÍC TRICHLOROET DIBROMOCHLC 1,1,2-TRICH BÉNZENE TRANS-1,3-D BROMOFORM METHYL ISOB METHYL BUTY TETRACHLORO	CHLOROPROPENE THENE (TRICHLOROETHYLE) DROMETHANE HLOROETHANE DICHLOROPROPENE BUTYL KETONE YL KETONE PETHENE (TETRACHLOROET) FRACHLOROETHANE ENE ENE JES	

REMARKS

FOOTNOTES *A-AVERAGE *AN-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN

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SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD, ATHENS, GA.

01/04/91

PURGEABLE ORGANICS DATA REPORT		0.,0.,0.
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** PROJECT NO. 91-025 SAMPLE NO. 51686 ** SOURCE: AMAX PHOSPHATE FACIL	SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL	**
** STATION ID: SB-02	COLLECTION START: 10/17/90 0945 STOP: 00/00/00	
**		**
** CASE NO.: 15099	SAS NO.: D. NO.: Y145	**
		* * * * ***
UG/KG ANALYTICAL RESULTS	UG/KG ANALYTICAL RESULTS	
12U CHLOROMETHANE	6U 1.2-DICHLOROPROPANE	
12U BROMOMETHANE	6U CÎŜ-1,3-DICĤLOROPROPENE	
12U VINYL CHLORIDE	6U TRICHLOROETHENE(TRICHLOROETHYLENE)	
12U CHLOROETHANE 6U METHYLENE CHLORIDE	6U DIBROMOCHLOROMETHANE 6U 1.1.2-TRICHLOROETHANE	
12U ACETONE		
6U CARBON DISULFIDE	6U BENZENE 6U TRANS-1,3-DICHLOROPROPENE	
6U 1.1-DICHLOROETHENE(1,1-DICHLOROETH)	HYLENE) 6U BROMOFORM	
6U 1,1-DICHLOROETHANE	12U METHYL ISOBUTYL KETONE	
6U 1,2-DICHLOROETHENE (TOTAL) 6U CHLOROFORM	12U METHYL BUTYL KETONE 6U TETRACHLOROETHENE(TETRACHLOROETHYLENE)	
6U 1.2-DICHLOROETHANE	6U 1,1,2,2-TETRACHLOROETHANE	
12U MÉTHYL ETHYL KETONE	6Ŭ TÓLÚĒŃĒ	
6U 1,1,1-TRICHLOROETHANE	6U <u>CHLOROBENZENE</u>	
6U CARBON TETRACHLORIDE 12U VINYL ACETATE	6U ETHYL BENZENE	
12U VINYL ACETATE 6U BROMODICHLOROMETHANE	6U STYRENE 6U TOTAL XYLENES	
O BROWD TOTAL TIME	16 PERCENT MOISTURE	

REMARKS

REMARKS

FOOTNOTES

*TOUTHOUTES***

*A-ACTUAL VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN

*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

DIIPO	EABLE ORGANICS DATA REPORT	EPA-REGION IV ESD. A	THENS, GA.	01/04/91
	* * * * * * * * * * * * * * * * * * *	TYPE: GROUNDWA PR	* * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * *
**	CASE NO.: 15099 SAS F * * * * * * * * * * * * * * * * * * *	NO.: D ************************************	. NO.: Y328 * * * * * * * * * * * * * * * * * * *	** * * * * * * * ***
	10U CHLOROMETHANE 10U BROMOMETHANE 10U VINYL CHLORIDE 10U CHLOROETHANE 5U METHYLENE CHLORIDE 20U ACETONE 5U CARBON DISULFIDE 5U 1,1-DICHLOROETHANE 5U 1,2-DICHLOROETHANE 5U 1,2-DICHLOROETHANE 5U 1,2-DICHLOROETHANE 10UR METHYL ETHYL KETONE 5U 1,2-DICHLOROETHANE 10UR METHYL ETHYL KETONE 5U 1,1-TRICHLOROETHANE 5U 1,1-TRICHLOROETHANE 5U CARBON TETRACHLORIDE 10U VINYL ACETATE 5U BROMODICHLOROMETHANE	1 1	1.2-DICHLOROPROPANE CIS-1.3-DICHLOROPROPENE TRICHLOROETHENE(TRICHLOROETHYLENE) DIBROMOCHLOROMETHANE L1.1.2-TRICHLOROETHANE TRANS-1.3-DICHLOROPROPENE BROMOFORM METHYL ISOBUTYL KETONE METHYL BUTYL KETONE TETRACHLOROETHENE(TETRACHLOROETHYLEN L1.1.2.2-TETRACHLOROETHANE CHLOROBENZENE CHLOROBENZENE SU STYRENE STYRENE STYRENE TOTAL XYLENES	Ε)

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

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PURGEABLE ORGANICS DATA REPORT
PROJECT NO. 91-025 SAMPLE NO. 51688 SAMPLE TYPE: SOIL SOURCE: AMAX_PHOSPHATE FACIL
                                                              PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1045 STOP: 00/00/00
* *
                                                                                                                   * *
    STATION ID: SD-10
                                                                                                                   * *
**
                                                                                                                   **
* *
    CASE NO.: 15099
                                         SAS NO.:
                                                                                                                   **
**
                                                               D. NO.: Y150
UG/KG
                     ANALYTICAL RESULTS
                                                             UG/KG
                                                                               ANALYTICAL RESULTS
                                                                9U 1,2-DICHLOROPROPANE
    19U CHLOROMETHANE
    19U BROMOMETHANE
                                                                90
                                                                   CÍS-1,3-DICHLOROPROPENE
TRICHLOROETHENE (TRICHLOROETHYLENE)
        VINYL CHLORIDE
    190
                                                                90
    190 CHLOROETHANE
                                                                   DIBROMOCHLOROMETHANE
                                                                90
     90 METHYLENE CHLORIDE
                                                                90
                                                                   1,1,2-TRICHLOROETHANE
    300
        ACETONE
                                                                90
                                                                   BENZENE
        CARBON DISULFIDE
                                                                   TRANS-1.3-DICHLOROPROPENE
                                                                90
        1,1-DICHLOROETHENE(1,1-DICHLOROETHYLENE)
                                                                9U BROMOFORM
        1,1-DICHLOROETHANE
                                                               190
                                                                   METHYL ISOBUTYL KETONE
        1,2-DICHLOROETHENE (TOTAL)
CHLOROFORM
                                                                   METHYL BUTYL KETONE
TETRACHLOROETHENE(TETRACHLOROETHYLENE)
                                                               190
     90
                                                                90
        1,2-DICHLOROETHANE
     9Ü
                                                                   1,1,2,2-TETRACHLOROETHANE
                                                                90
    19U MÉTHYL ETHYL KETONE
                                                                90
                                                                   TÓLÚENE
     90
        1,1,1-TRICHLOROETHANE
                                                                9Ü
                                                                   CHLOROBENZENE
     90
        CARBON TETRACHLORIDE
                                                                   ETHYL BENZENE
        VINYL ACETATE
                                                                9υ
                                                                   STYRENE
        BROMODICHLOROMETHANE
                                                                   TOTAL XYLENES
                                                                9υ
                                                                   PERCENT MOISTURE
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REMARKS

FOOTNOTES

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*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

PURGEABLE ORGANICS DATA REPORT			
*** * * * * * * * * * * * * * * *	E NO. 51689 SAMPLE TYPE: SOIL		<u> </u>
** CASE NO.: 15099	SAS NO.: * * * * * * * * * * * * * * * * * * *	D. NO.: Y148 * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * * *
13U CHLOROMETHANE 13U BROMOMETHANE 13U VINYL CHLORIDE 13U CHLOROETHANE 6U METHYLENE CHLORIDE 13U ACETONE 6U CARBON DISULFIDE 6U 1,1-DICHLOROETHANE 6U 1,2-DICHLOROETHANE 6U 1,2-DICHLOROETHANE 13U METHYL ETHYL KETONE 6U 1,1-TRICHLOROETHANE 13U METHYL ETHYL KETONE 6U CARBON TETRACHLORIDE 13U VINYL ACETATE 6U BROMODICHLOROMETHANE	·	6U 1,2-DICHLOROPROPANE 6U CIS-1,3-DICHLOROPROPENE 6U TRICHLOROETHENE(TRICHLOROET 6U DIBROMOCHLOROMETHANE 6U BENZENE 6U TRANS-1,3-DICHLOROPROPENE 6U BROMOFORM 13U METHYL ISOBUTYL KETONE 13U METHYL BUTYL KETONE 6U TETRACHLOROETHENE(TETRACHLO 6U 1,1,2,2-TETRACHLOROETHANE 6U TOLUENE 6U CHLOROBENZENE 6U CHLOROBENZENE 6U STYRENE 6U TOTAL XYLENES 20 PERCENT MOISTURE	

REMARKS

FOOTNOTES *TOUINGLES***

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SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD, ATHENS, GA.

01/04/91

PURGEABLE ORGANICS DATA REPORT	,	5.,5.,5.
*** * * * * * * * * * * * * * * * * * *		* * * * * * ***
** PROJECT NO. 91-025 SAMPLE NO. 51690 SAMPLE TYPE: GROUNDWA	PROG ELEM: NSF COLLECTED BY: M GORDON	***
** SOURCE: AMAX_PHOSPHATE FACIL	CITY: PALMETTO ST: FL	**
** STATION ID: TW-02	COLLECTION START: 10/17/90 1040 STOP: 00/00	0/00 **
**		**
	D. NO.: Y146	**
*** * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * * *	* * * * * * ***
UG/L ANALYTICAL RESULTS	UG/L ANALYTICAL RESULTS	
10U CHLOROMETHANE	5U 1,2-DICHLOROPROPANE	
10U BROMOMETHANE	5U CIS-1,3-DICHLOROPROPENE	
10U VINYL CHLORIDE	5U TRICHLOROETHENE (TRICHLOROETHYLENE)	
10Ŭ ĈĤLOROETHANE	5U DIBROMOCHLOROMETHANE	
6U METHYLENE CHLORIDE	5U 1,1,2-TRICHLOROETHANE	
10U ACETONE	5U BENZENE	
SU CARBON DISULFIDE	5U TRANS-1.3-DICHLOROPROPENE	
5U 1.1-DICHLOROETHENE(1.1-DICHLOROETHYLENE)	5U BROMOFORM	
5U 1,1-DICHLOROETHANE	10U METHYL ISOBUTYL KETONE	
5U 1,2-DICHLOROETHENE (TOTAL)	10U METHYL BUTYL KETONE	
5U CHLOROFORM	5U TETRACHLOROETHENE (TETRACHLOROETHYLENE)	
50 1,2-DICHLOROETHANE	5U 1,1,2,2-TETRACHLOROETHANE	
10U METHYL ETHYL KETONE	5U TOLUENE	
5U 1,1,1-TRICHLOROETHANE	5U CHLOROBENZENE	
5U CARBON TETRACHLORIDE	5U ETHYL BENZENE	
10U VINYL ACETATE 5U BROMODICHLOROMETHANE	5U STYRENE	
5U BROMODICHLOROMETHANE	5U TOTAL XYLENES	

REMARKS

REMARKS

^{*}A-AVERAGE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD, ATHENS, GA.

01/04/91

REMARKS

REMARKS

FOOTNOTES

*A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
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SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD, ATHENS, GA.

01/04/94

MISCELLANEOUS PURGEABLE ORGANICS - DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51642 SAMPLE TYPE: GROUNDWA PROG ELEM: NSF COLLECTED BY: M GORDON SOURCE: AMAX PHOSPHATE FACIL ** CITY: PALMETTO ST: FL ** COLLECTION START: 10/15/90 0630 STOP: 00/00/00 D. NO.: Y325 MD NO: Y325 STATION ID: PB-01 ** CASE NO .: 15099 SAS NO.: ** ** * * * *

ANALYTICAL RESULTS UG/L

ACETALDEHYDE 6JN

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
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SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD, ATHENS, GA.

01/04/94

MISCELLANEOUS PURGEABLE ORGANICS - DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51650 SAMPLE TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON SOURCE: AMAX PHOSPHATE FACIL ** CITY: PALMETTO ST: FL STATION ID: SW-11 COLLECTION START: 10/17/90 1445 STOP: 00/00/00 ** MD NO: Y158 CASE NO .: 15099 SAS NO.: D. NO.: Y158 * * ** ** **

ANALYTICAL RESULTS UG/L

8JN TETRAMETHYLBUTANE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD, ATHENS, GA.

01/04/91

MISCELLANEOUS PURGEABLE ORGANICS - DATA REPORT PROG ELEM: NSF COLLECTED BY: M GORDON PROJECT NO. 91-025 SAMPLE NO. 51653 SAMPLE TYPE: SOIL SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO ST: FL ** * * COLLECTION START: 10/17/90 1520 STOP: 00/00/00 STATION ID: SD-07 * * ** CASE . NO .: 15099 MD NO: Y160 SAS NO.: D. NO.: Y160 * * ** **

ANALYTICAL RESULTS UG/KG

20J 1 UNIDENTIFIED COMPOUND 30JN TRIMETHYLBICYCLOHEPTANE 200JN METHYL (METHYLETHYL) BENZENE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
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*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD. ATHENS. GA.

01/04/94

MISCELLANEOUS PURGEABLE ORGANICS - DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51664 SAMPLE TYPE: GROUNDWA PROG ELEM: NSF COLLECTED BY: M GORDON ** SOURCE: AMAX PHOSPHATE FACIL ** CITY: PALMETTO ST: FL ** COLLECTION START: 10/18/90 0930 STOP: 00/00/00 STATION ID: TW-05 * * CASE.NO.: 15099 SAS NO.: D. NO.: Y172 MD NO: Y172 ** ** * * * *

ANALYTICAL RESULTS UG/L

7JN TETRAMETHYLBUTANE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Region IV

Environmental Services Division College Station Road, Athens, Ga. 30613



****MEMORANDUM*****

DATE: 01/05/91

SUBJECT: Results of Extractable Organic Analysis;

91-025 AMAX PHOSPHATE FACIL

PALMETTO FL CASE NO: 15099

FROM: Robert W. Knight

Chief, Laboratory Evaluation/Quality Assurance Section

TO: PHIL BLACKWELL

Attached are the results of analysis of samples collected as part of the subject project.

As a result of the Quality Assurance Review, certain data qualifiers may have been placed on the data. Attached is a DATA QUALIFIER REPORT which explains the reasons that these qualifiers were required.

If you have any questions please contact me.

ATTACHMENT

ORGANIC DATA QUALIFIER REPORT

Case Number 15099

Project Number

91-025

SAS Number

Site ID. Amax Phosphate Facil, Palmetto, FL.

Affected Samples	Compound or Fraction	Flag <u>Used</u>	Reason
Volatiles DY143,157,158,161 163,165,167,169, 172,175,327-329 DY158	, 2-butanone carbon disulfide	R J	low response factor <quantitation limit<="" td=""></quantitation>
Extractables all samples DY146	di-n-butylphthalate benzo(a)anthracene all positives	J J J	low QC spike recovery low QC spike recovery <quantitation limit<="" td=""></quantitation>
<u>Pesticides</u>			

none

ORGANIC DATA QUALIFIER REPORT

Case Number 15099

Project Number

91-025

SAS Number

Site ID. Amax Phosphate Facil, Palmetto, FL.

Affected Samples	Compound or Fraction	Flag <u>Used</u>	Reason
Volatiles DY173,170,152,155 140,138,144	all positives	J	<quantitation limit<="" td=""></quantitation>
Extractables all samples bis	(2-chloroisopropyl)ether nitrobenzene 1,2,4-trichlorobenzene 2-chloronaphthalene	R un R u R	nacceptable recovery blind spike macceptable recovery blind spike unacceptable recovery blind spike unacceptable recovery blind spike
DY168,160,136 DY168,136 DY168,160,136	3-nitroaniline phenanthrene pyrene benzo(a)anthracene chrysene	R J J	unacceptable recovery blind spike <quantitation <quantitation="" limit="" limit<="" td=""></quantitation>
DY164,159,170,153 DY160 DY160,136	benzo(b)fluoranthene benzo(a)pyrene]]] J J J	<pre><quantitation <quantitation="" limit="" limit<="" pre=""></quantitation></pre>
DY136 DY150 DY160 DY156,159,162,164	indeno(1,2,3-cd)pyrene benzo(g,h,i)perylene benzoic acid acenaphthene	J J J	<pre><quantitation <quantitation="" but="" factor="" limit="" low="" pre="" present<="" response=""></quantitation></pre>
166,168,170,171, 173,174	acenaphthene	R	low response factor
<u>Pesticides</u> DY144	alpha-Chlordane gamma-Chlordane	J J	<quantitation <quantitation="" limit="" limit<="" td=""></quantitation>

SYSTEM	GA.
MPLE AND ANALYSIS MANAGEMENT	ION IV ESE
WIPLE AND	EPA-REG

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01/04/9	* * * * *	* * *	
ENT SYSTEM NS, GA.	* * * * * * * * * * * * * * * * * * *	D. NO.: Y325 * * * * * * * * * * * * * * * * * * *	3-NITROANILINE ACENAPHTHENE ACENAPHTHENE 2.4-DINITROPHENOL DISELVE PHTHALATE 2.4-DINITROTOLUENE DISTRICTORNIC 2.4-DINITROTOLUENE DISTRICTOR PHTHALATE 4-CHLOROPHENYL PHENYL ETHER FLUCKENE 4-NITROSODIPHENYLAMINE/DIPHENYLAMINE 2-METHYL-4.6-DINITROPHENOL N-NITROSODIPHENYLAMINE/DIPHENYLAMINE 4-BROMOPHENYL PHENYL ETHER HEXACHLOROPHENYL PHENYL ETHER HEXACHLOROPHENOL PHENANTHRENE ANTHRACENE DI-N-BUTYLPHTHALATE FLUCKORNICHENE BENZYL BUTYL PHTHALATE FLUCKORNITHRACENE BENZYL BUTYL PHTHALATE FLUCKORNITHRACENE BENZYL BUTYL PHTHALATE FLUCKORNITHRACENE BENZO-A-PYRENE DI-N-OCTYLPHTHALATE BENZO-A-PYRENE DISTRICTORY BENZO-A-PYRENE BENZO-A-PYRENE BENZO-A-PYRENE BENZO-A-PYRENE BENZO-A-PYRENE BENZO-A-PYRENE BENZO-CHIPHRACENE BENZOCA-HJANTHRACENE BENZOCA-HJANTHRACENE
MANAGEME D, ATHEN	* * * * * PROG E CITY:	D. NC * * * UG/L	222222222222222222222222222222222222222
SAMPLE AND ANALYSIS MANAGEMENT EPA-REGION IV ESD, ATHENS,	* * * * * * * * * * * * * * * * * * *	SAS NO.: * * * * * * * * * * * * * * * * * * *	E E (HCCP)
ORGANICS DATA	* * * * * * * * * * * * * * * * * * *	CASE NO.: 15099 * * * * * * * * * * * * * * * * * * *	PHENOL BIS(2-CHLOROETHYL) ETHER 1.2-CHLOROBENZENE 1.4-DICHLOROBENZENE 1.2-DICHLOROBENZENE BENZYL ALCOHOL 1.2-DICHLOROBENZENE 2-METHYLPHENOL BIS(2-CHLOROISOPROPYL) ETHER (3-AND/OR 4-)METHYLPHENOL N-NITROSODI-N-PROPYLAMINE HEXALOROETHANE 1.2-H-DIMETHYLPHENOL 2.4-DIMETHYLPHENOL 2.4-DIMETHYLPHENOL BENZOIC ACID BENZOIC ACID BENZOIC ACID BENZOIC ACID CALLOROPHENOL 1.2.4-DICHLOROBENZENE NAPHTHALENE HEXACHLOROSUITADIENE HEXACHLOROSUITADIENE 4-CHLOROAILINE EXACHLOROSUITADIENE THYLNAPHTHALENE 2.4-S-TRICHLOROPHENOL 2.4-S-TRICHLOROPHENOL 2.4-S-TRICHLOROPHENOL 2.4-S-TRICHLOROPHENOL 2.4-S-TRICHLOROPHENOL 2.4-S-TRICHLOROPHENOL 2.4-S-TRICHLOROPHENOL 2.4-S-TRICHLOROPHENOL 2.4-S-TRICHLOROPHENOL 2.4-S-TRICHLOROPHENOL 2.4-S-TRICHLOROPHENOL 2.4-S-TRICHLOROPHENOL 2.4-S-TRICHLOROPHENOL 2.6-DINITROILURE 2.6-DINITROILURE
EXTRACTABLE	** PROJECT ** SOURCE: ** STATION	** CASE *** * * UG/L	20000000000000000000000000000000000000

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*A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

*A-AVERAGE VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN

*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN

*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE WINIMUM QUANTITATION LIMIT.

*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

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SAMPLE AND ANALYSIS MANAGEMENT SYSTEM . EPA-REGION IV ESD, ATHENS, GA.	* * * * * * * * * * * * * * * * * * *	0.: 15099 * * * * * * * * * * * * * * * * * * *	PHENOL PH
EXTRACTABLE ORGANI	* * * * * * * * * * * * * * * * * * *	CASE NO * * * * UG/KG	880U 2-CHLORO 880U 1.3-DICH 880U 1.3-DICH 880U 1.2-DICH 880U 1.2-DICH 880U 1.2-DICH 880U 2.4-DICH 880U 2-NITROBEN 880U 2-NITROBEN 880U 2-NITROBEN 880U 2-NITROBEN 880U 2-NITROBEN 880U 2-1CH 880U 2-1CH 880U 2-1CH 880U 2-4-DICH 880U 2-4-DICH 880U 2-4-DICH 880U 2-4-DICH 880U 2-4-DICH 880U 2-4-DICH 880U 2-4-DICH 880U 2-4-CHLORO 880U 2-4-CHLORO 880U 2-4-S-TR 880U 2-4-S-TR 880U 2-4-S-TR
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FOOTNOTES
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ORGANICS DATA	* * * * * * * * * * * * * * * * * * *	<u> </u>	PHENOL BIS(2-CHLOROETHYL) ETHER 1,3-DICHLOROBENZENE 1,4-DICHLOROBENZENE 1,4-DICHLOROBENZENE 2,0-DICHLOROBENZENE 2,0-CHLOROBENZENE 2,0-CHLOROBENZENE 2,0-CHLOROBENZENE 1,2-DICHLOROBENZENE 2,0-CHLOROBENZENE NEXACHLOROETHANE NITROPHENOL 2,4-DIMETHYLPHENOL BENZOL 2,4-DIMETHYLPHENOL BENZOL 2,4-DIMETHYLPHENOL BENZOL 2,4-DIMETHYLPHENOL EXACHLOROPHENOL 1,2,4-TRICHOROBENZENE HEXACHLOROPHENOL 2,4-G-TRICHOROBENZENE HEXACHLOROPHENOL 2,4-G-TRICHOROPHENOL 2,1-G-TRICHOROPHENOL 3,1-G-TRICHOROPHENOL 3,1-G-TRICHOROPHENOL 3,1-G-TRICHOROPHENOL 3,1-G-TRICHOROPHENOL 3,1-G-TRICHOROPHENOL 3,1-G-TRICHOR
FXTRACTABLE	** * * * * * * * * * * * * * * * * * *	CASE * * * * UG/L	252222222222222222222222222222222222222

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FOOTNOTES
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SAMPLE AND ANALYSIS MANAGEMENT SYSTEM

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SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD, ATHENS, GA.	* * * * * * * * * * * * * * * * * * *	PROG ELEM: NSF COLLECTED BY: M GO CITY: PALMETTO ST. FL COLLECTED BY: M GO ST. FL COLLECTION START: 10/17/90 1610 AS NO.: D. NO.: V164 * * * * * * * * * * * * * * * * * * *	ACENAPHTHENE ACENAPHTHENE ACENAPHTHENE 2.4—DINITROPHENOL DIBENZOFURAN 2.4—DINITROPHENOL DIETHYL PHTHALATE 4—CHLOROPHENYL PHENYL ETHER FLUCKENE 4—NITROSOLIPHENYL AMINE 4—NITROSOLIPHENYLAMINE M-NITROSOLIPHENYLAMINE ROSOLIPHENYL M-NITROSOLIPHEN M-NITROSOLIPHENYL M-NITROSOLIPHE
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(10	COLLECTED BY: M GORDON ST: FL ST. FL STOP: 00/00/00	* * * * * * * * * * * * * * * * * * *	3-NITROANILINE ACENAPHTHENE 2.4-DINITROPHENOL DIBENZOFURAN 2.4-DINITROPHENOL DISENZOFURAN 2.4-DINITROPOLUENE DISENZOFURAN 2.4-DINITROPOLUENE DISTRICTORITROPHENOL A-CHLOROPHENYL PHENYL ETHER 12-METHYL—A-DINITROPHENOL A-NITROSOLIPHENYLAMINE A-BROMOPHENYL PHENYL ETHER HEXACHLOROBENZENE (HCB) PENTACHLOROPHENOL PHENACHLOROPHENOL PHENACHLOROPHENOL PHENACHLOROPHENOL PHENACH BOIN-COLOROBENZIDINE BENZYL BUTYL PHTHALATE BOIN-OCTYLPHTHALATE BENZYC (A) ANTHRACENE BIS (2-ETHYLHEXYL) PHTHALATE BENZOC (B) AND PRENE BENZOC (B) AND PRENE BENZOC (B) AND PRENE BENZOC (B) AND PRENE BENZOC (B) AND PRENE BENZOC (C) ANTHRACENE BENZOC (C) ANTHRACENE BENZOC (C) ANTHRACENE BENZOC (C) ANTHRACENE BENZOC (C) ANTHRACENE BENZOC (C) ANTHRACENE BENZOC (C) ANTHRACENE BENZOC (C) ANTHRACENE BENZOC (C) ANTHRACENE BENZOC (C) ANTHRACENE BENZOC (C) ANTHRACENE BENZOC (C) ANTHRACENE BENZOC (C) ANTHRACENE
SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD, ATHENS, GA.	* * * * * * * * * * * * * * * * * * *	SAS NO.: D. NO.: V159 * * * * * * * * * * * * * * * * * * *	6700UR ACENAPITHE 6700U 2.4-DINITH 6700U 2.4-DINITH 1400U 018ENZOFUH 1400U 018THYLPOPUH 140UU 018THYLPOPUH 140UU 018THYLPOPUH 140UU 018THYLPOPUH 140UU 018THYLPOPUH 140UU 018THYLPOPUH 140UU 018THYLPOPUH 140UU 018THYLPOPUH 140UU 018THYLPOPUH 140UU 018THYLPOPUH 140UU 018THYLPOPUH 140UU 018THYLPOPUH 140UU 018THYLPOPUH 140UU 018THYLPOPUH 140UU 018THYLPOPUH 140UU 018THYLPOPUH 140UU 018THYLPOPUH 140UU 018THYLPOPUH 1
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SAMPLE AND ANALYSIS MANAGEMENT EPA-REGION IV ESD, ATHENS, EXTRACTABLE ORGANICS DATA REPORT	* * * * * * * * * * * * * * * * * * *	SAS NO.: * * * * * * * * * * * * * * * * * * *	100 PHENOL 100 BIS(2-CHLOROETHYL) ETHER 100 1-3-DICHLOROBENZENE 100 1-3-DICHLOROBENZENE 100 1-4-DICHLOROBENZENE 100 1-2-DICHLOROBENZENE 100 2-METHYL ALCOHOL 100 2-METHYL PHENOL 100 1-2-DICHLOROBENZENE 100 2-METHYL PHENOL 100 2-MITROSODI-N-PROPYLAMINE 100 N-NITROSODI-N-PROPYLAMINE 100 2-NITROSODI-N-PROPYLAMINE 100 2-DICHLOROBENZENE 100 2-DICHLOROBENOL 100 2-DICHLOROBENOL 100 2-DICHLOROBENOL 100 4-CHLOROPHENOL 100 4-CHLOROPHENOL 100 4-CHLOROPHENOL 100 4-CHLOROPHENOL 100 4-CHLOROPHENOL 100 2-TRICHLOROPHENOL 100 4-CHLOROPHENOL 100 2-TRICHLOROPHENOL 100 2-CHLORONAPHITHALENE 100 2-CHLORONAPHITHALENE 100 2-CHLOROMAPHITHALENE
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ORGANICS DATA REPORT * * * * * * * * * * * * * * * * * * *	15099	Sagour Sacration Sacrati
ORO***********************************	* CASE NO.: 1 ** * * * * * * UG/KG	11000 BIS(2-CHLORG 11000 1.3-DICHLORG 11000 1.4-DICHLORG 11000 1.2-DICHLORG 11000 1.2-DICHLORG 11000 2.METHYLPHEN 11000 2.METHYLPHEN 11000 1.2-DICHLORG 11000 2.4-DIMENZON 11000 2.4-DIMENZON 11000 2.4-DIMENZON 11000 2.4-DIMENZON 11000 12.4-DICHLORG 11000 12.4-DICHLORG 11000 2.4-S-TRICH 11000 2.4-S-TRICH 11000 2.4-S-TRICH 11000 2.4-S-TRICH 11000 2.4-S-TRICH 11000 2.4-S-TRICH 11000 2.4-S-TRICH 11000 2.4-S-TRICH 11000 2.4-S-TRICH 11000 2.4-S-TRICH 11000 2.4-S-TRICH 11000 2.4-S-TRICH 11000 2.4-S-TRICH 11000 2.4-S-TRICH 11000 2.4-S-TRICH 11000 2.6-DIMETHYLPH
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SYSTEM GA.	* * * * * * * * * * * * * * * * * * *	BY: M GU ST: FL 1520 * * * *	ACENAPHTHENE ACENAPHTHENE ACENAPHTHENE 2.4—DINITROPHENOL DIBENZOFURANO 2.4—DINITROPHENOL DIETHYL PHTHALATE DIETHYL PHTHALATE DIETHYL PHTHALATE DIETHYL AG-DINITROPHENOL A-NITROANILINE A-NITROANILINE A-NITROANILINE DIETHYL AG-DINITROPHENOL A-NITROANILINE A-NITROA
YSIS MANAGEME IV ESD. ATHEN			4.300 U 4.40 U 4
SAMPLE AND ANALYSIS MANAGEMENT EPA-REGION IV ESD, ATHENS,		SAS NO.:	
NE ORGANICS DATA REPORT		40.: 15(* * * *	PHENOL BIS(2-CHLOROETHYL) ETHER 1-CHLOROPHENOL 1-CHLOROBENZENE 1-2-DICHLOROBENZENE 1-2-DICHLOROBENZENE 1-2-DICHLOROBENZENE 1-2-DICHLOROBENZENE 1-2-DICHLOROBENZENE 1-2-DICHLOROBENZENE 1-2-METHYLPHENOL 1-2-AND/OR 4-)METHYLPHENOL 1-2-AND/OR 4-)METHYLPHENOL 2-AND/OR 4-)METHYLPHENOL 2-A-DIMETHYLPHENOL 2-A-DICHLOROPHENOL 2-A-DICHLOROPHENOL 1-2-A-TRICHLOROPHENOL 1-2-CHLORONAPHITALENE
EXTRACTABLE	** * * * * * * * * * * * * * * * * * *	** CASE *** * * * UG/KG	88888888888888888888888888888888888888

REMARKS

FOOTNOTES
*A—AVERAGE VALUE *NA—NOT ANALYZED *NAI—INTERFERENCES *J—ESTIMATED VALUE *N—PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*A—AVERAGE VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L—ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*V—ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L—ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN
*U—MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT
*R—QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

REMARKS

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*A-AVERAGE VALUE

*K-ACTUAL VALUE II

*U-MATERIAL WAS AI

*R-QC INDICATES TI *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

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EXTRACTABLE ORGANICS DATA REPORT
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** PROJECT NO. 91-025 SAMPLE

** SOURCE: AMAX PHOSPHATE FACIL

** STATION ID: SD-06 CASE NO.: 15099 * * ĕ* * * * 51655 * # SAMPLE * SAS NO.: SAMPLE AND ANALYSIS MANAGEMENT EPA-REGION IV ESD. ATHENS. PROG ELEM: NSF COCITY: PALMETTO COLLECTION START: 0 NO.: Y156 GA. *

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(2-CHLOROETHYL) ETHER

R 3-NITROANILINE
R ACENAPHTHENE
R ACENAPHTHENE
R ACENAPHTHENE
R ACENAPHTHENE
R ACENAPHTHENE
R 2.4-DINITROPHENOL
DIBENZOFURAN
U 2.4-DINITROTOLUENE
U 2.4-DINITROTOLUENE
U 1.4-DINITROTOLUENE
U 2.4-DINITROTOLUENE
U 2.4-DINITROTOLUENE
U 2.4-DINITROTOLUENE
U 2.4-DINITROPHENYL
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U 3.3-DICHLOROBENZIDINE
U 3.3-DICHLOROBENZIDINE
U 3.3-DICHLOROBENZIDINE
U 3.3-DICHLOROBENZIDINE
U 3.3-DICHLOROBENZIDINE
U BENZYL
U BUTYL
U PHTHALATE
U BIS(2-ETHYLHEXYL)
DI-N-OCTYLPHTHALATE
U BENZO(B AND/OR K)FLUORANTHENE
U BENZO(B AND/OR K)FLUORANTHENE
U BENZO(A, H) ANTHRACENE
U BENZO(GHI) PERYLENE
U BENZO(GHI) PERYLENE

2-CHLOROPHENOL
1, 3-DICHLOROBENZENE
1, 4-DICHLOROBENZENE
1, 2-DICHLOROBENZENE
1, 2-DICHLOROBENZENE
1, 2-DICHLOROBENZENE
1, 2-METHYLPHENOL
BIS(2-CHLOROISOPROPYL) ETHER
(3-AND/OR 4-)METHYLPHENOL
N-NITROSODI-N-PROPYLAMINE
HEXACHLOROETHANE
2-NITROBENZENE
1SOPHORONE
2-NITROBENZENE
1SOPHORONE
2-A-DICHLOROPHENOL
BIS(2-CHLOROETHOXY) METHANE
1, 2-4-DICHLOROPHENOL
2-4-DICHLOROBENZENE
NAPHTHALENE
1-2-METHYLPHENOL
2-METHYLNAPHTHALENE
HEXACHLORO-3-METHYLPHENOL
2-4-S-TRICHLOROPHENOL
2-4-S-TRICHLOROPHENOL
2-4-S-TRICHLOROPHENOL
2-CHLORONAPHTHALENE
DIMETHYL PHTHALENE
ACENAPHTHYLENE
2-CHLORONAPHTHALENE
DIMETHYLPHENOL
2-CHLORONAPHTHALENE
ACENAPHTHYLENE

REMARKS

REMARKS

FOOTNOTES

*A-AVERAGE VALUE

*K-ACTUAL VALUE II

*U-MATERIAL WAS AI

*P-QC INDICATES TI *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

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	* * * * * * * * * * * * * * * * * * *	.: Y174 * * * *	ACENAPHTHENE ACENAPHTHENE 2.4-DINITROPHENOL DIBENZOFURAN 2.4-DINITROPHENOL DIETHYL PHTHALATE 4-CHLOROPHENYL PHENYL ETHER FLUCKENE 4-NITROSOLUENE 2-METHYL-4:6-DINITROPHENOL N-NITROSOLIPHENYLAMINE 4-BROMOPHENYL PHENYL ETHER 1-ROSOLIPHENYLAMINE N-NITROSOLIPHENYLAMINE 1-ROSOLIPHENYLAMINE 1-ROSOLIPHENYL FILER N-NITROSOLIPHENYL FILER 1-ROSOLIPHENYL PHTHALATE N-N-BUTYLPHTHALATE
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ANAL	\$ * * \$01L	*	•
SAMPLE AND ANALYSIS MANAGEMENT EPA-REGION IV ESD, ATHENS,	* * * TYPE:	*	
AMPLE		S NO.	
Ñ	* * * * SAMPLE	SAS * *	
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	RGA NO * GO ID:	15099	NOTITION THE COLUMN TH
		.:* O* G*	PHENOL BIS (2-CHLOROETHYL) ETHER 1,3-DICHLOROBENZENE 1,3-DICHLOROBENZENE BENZYL ALCOHOL 2,4-DICHLOROBENZENE BENZYL ALCOHOL 2,1-THYLPHENOL BIS (2-CHLOROISOPROPYL) ETHE (3-AND/OR 4-)METHYLPHENOL BIS (2-CHLOROITANE NITROBENZENE ISOPHORONE 2,4-DIMETHYLPHENOL 2,4-DIMETHYLPHENOL 2,4-DICHLOROPHENOL 2,4-DICHLOROPHENOL 1,2,4-DICHLOROPHENOL 1,2,4-DICHLOROPHENOL 1,2,4-DICHLOROPHENOL 1,2,4-DICHLOROPHENOL 2,4-DICHLOROPHENOL 2,4-S-TRICHLOROPHENOL 2,5-CHLORONAPHIMALENE 2,0-DINITROTOLUENE 2,6-DINITROTOLUENE
	EXTRACTABLE ** * * * ** PROJEC ** SOURCE ** STATIO	CASE * * * UG/KG	88888888888888888888888888888888888888
	X * * * * * * * * * * * * * * * * * * *	* * *	ա ա છ ա છ

REMARKS

FOOTNOTES
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EXTRACTABLE *** * *

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CASE NO.: 15
  ACTABLE ORGANICS DATA REPORT

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PROJECT NO. 91-025 SAMPLE
SOURCE: AMAX PHOSPHATE FACIL
STATION ID: TW-04
PHENOL
BIS(2-CHLOROPHENOL
1,3-DICHLOROBENZENE
1,4-DICHLOROBENZENE
1,4-DICHLOROBENZENE
1,2-DICHLOROBENZENE
BIS(2-CHLOROBENZENE
2-METHYLPHENOL
1,2-AND/OR 4-)METHYLPHENOL
NITROSODI-N-PROPYLAMINE
HEXACHLOROETHANE
NITROBENZENE
2-NITROPHENOL
2,4-DIMETHYLPHENOL
2,4-DIMETHYLPHENOL
BIS(2-CHLOROETHOXY) METHANE
1-2,4-DIMETHYLPHENOL
2,4-DIMETHYLPHENOL
2,4-DICHLOROPHENOL
1,2,4-TRICHLOROBENZENE
1-2,4-TRICHLOROBENZENE
1-2,4-TRICHLOROBENZENE
1-2,4-TRICHLOROBENZENE
1-2,4-TRICHLOROBENZENE
1-2,4-G-TRICHLOROPHENOL
2,4,6-TRICHLOROPHENOL
2,4,6-TRICHLOROPHENOL
2,4,6-TRICHLOROPHENOL
2,4,6-TRICHLOROPHENOL
2,4,6-TRICHLOROPHENOL
2,4,6-TRICHLOROPHENOL
2,4,6-DINITROTOLUENE
                                                                                                                                                                                                                                                                                                 15099
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                                                                                                                                                                                                                                                                                       * * * * * * * * * * ANALYTICAL RESULTS
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51662
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                                                                                                                                                                                                                                                                                                 SAS NO.:
                                                                                                                                                                                                                                                                                                                                        TYPE: GROUNDWA
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                                                                                                                                                                                                                                                                                                                        PROG ELEM: NSF COCITY: PALMETTO COLLECTION START:
                   0
                JANITROANILINE

JACENAPHTHENE

JACENAPHTHENE

A-NITROPHENOL

2.4-DINITROPHENOL

DIETHYL PHTHALATE

JACHLOROPHENYL PHENYL ETHER

FLUORENE

4-NITROANILINE

UA-NITROANILINE

UA-NITROANILINE

UA-NITROANILINE

UA-NITROSODIPHENYL PHENYL ETHER

UA-NITROSODIPHENYL PHENYL ETHER

UA-BUTYL PHENYL ETHER

UANTHRACENE

DI-N-BUTYL PHTHALATE

UANTHRACENE

JENZYL BUTYL PHTHALATE

UBENZO(A) ANTHRACENE

UBENZO(A) ANTHRACENE

UBENZO(A) ANTHRACENE

UBENZO(A) ANTHRACENE

UIDENO(1,2,3-CD) PYRENE

UIDENO(GHI)PERYLENE
                                                                                                                                                                                                                                                                                                 NO.: Y175
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                                                                                                                                                                                                                                                                                                                                       COLLECTED
                                                                                                                                                                                                                                                                                        ANALYTICAL RESULTS
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                                                                                                                                                                                                                                                                                                                        GORDON
                                                                                                                                                                                                                                                                                                                        STOP:
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REMARKS ***REMARKS***

FOOTNOTES

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*K-ACTUAL VALUE I:

*U-MATERIAL WAS A!

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E AND ANALYSIS MANAGEMENT	ATHENS,
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01/04/9	*	*	
SYSTEM GA.	* * * * * * * * * * * * * * * * * * *	PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO START: 10/18/90 1020 STOP: 00/00/00 D. NO.: V173	3-NITROANILINE ACENAPHTHENE 2.4-DINITROPHENOL DIBENZOFURANO 2.4-DINITROTOLUENE DIETHYL DISTRACTOLUENE DIETHYL A-VICHCROPHENYL A-NITROSONIPHENYL A-NITROSONIPHENYL A-NITROSONIPHENYL A-NITROSONIPHENYL A-NITROSONIPHENYL A-NITROSONIPHENYL A-BROMOPHENYL B-NITROSONIPHENYL A-BROMOPHENYL A-BROMOPHENYL B-NITROSONIPHENYL A-BROMOPHENYL B-NITROSONIPHENYL B-NITROSONIPHENYL B-NITROSONIPHENYL B-NITROSONIPHENYL B-NITROSONIPHENYL B-NITROSONIPHENAL B-NITROSON
LYSIS MANAGEM I IV ESD, ATHE			4
SAMPLE AND ANALYSIS MANAGEMENT EPA-REGION IV ESD, ATHENS,	* * * * * * * * * * * * * * * * * * *	SAS NO.:	
TE COCANITOS DATA BEDODE	CKGANICS DATA * * * * * * * * * * * * * * * * * * *	NO.: 15099 * * * * * * * * * * * * * * * * * * *	PHENOL BIS(2-CHLOROETHYL) ETHER 2-CHLOROPHENOL 1,3-DICHLOROBENZENE BENZYL ALCOHOL 1,2-DICHLOROBENZENE ENZYL ALCOHOL 1,2-DICHLOROBENZENE 2-METHYLPHENOL BIS(2-CHLOROBENZENE N-NITROSODI-N-PROPYL DETHER (3-AND/OR 4-) METHYLPHENOL N-NITROSODI-N-PROPYL METHANE 1.2-A-DIMETHYLPHENOL BENZCHLOROETHANE 1.5OPHORONE 2-NITROPHENOL BENZCHLOROBENZENE 1.2-A-TRICHLOROBENZENE 1.2-A-TRICHLOROBENZENE 4-CHLOROANIL INE EXACHLOROANIL INE EXACHLOROANIL INE EXACHLOROANIL INE HEXACHLOROPHENOL 2-4-6-TRICHLOROPHENOL 2-4-6-TRICHLOROPHENOL 2-4-6-TRICHLOROPHENOL 2-4-6-TRICHLOROPHENOL 2-4-6-TRICHLOROPHENOL 2-4-6-TRICHLOROPHENOL 2-4-5-TRICHLOROPHENOL 2-4-5-TRICHLOROPHENOL 2-4-5-TRICHLOROPHENOL 2-4-5-TRICHLOROPHENOL 2-4-5-TRICHLOROPHENOL 2-4-5-TRICHLOROPHENOL 2-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1
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REMARKS

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REPORT

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***REMARKS***
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*A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE

*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE

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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               CASE NO.:
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                PROJECT NO. 91-025 SAMPLE SOURCE: AMAX PHOSPHATE FACIL STATION ID: SS-05
                                                                                                                                                                                                                                                                                                                                                                                PHENOL
BIS (2-CHLOROBENZENE
1,3-DICHLOROBENZENE
1,3-DICHLOROBENZENE
1,4-DICHLOROBENZENE
1,4-DICHLOROBENZENE
1,4-DICHLOROBENZENE
1,4-DICHLOROBENZENE
1,4-DICHLOROBENZENE
2-METHYLPHENOL
N-MROPYL AMINE
NITROSODI-N-PROPYLAMINE
HEXACHLOROETHANE
2-NITROPHENOL
2,4-DIMETHYLPHENOL
BENZOIC ACID
BENZOIC ACID
BIS (2-CHLOROBETHOXY) METHANE
2,4-DICHLOROBHENOL
1,2,4-TRICHLOROBENZENE
1-2,4-TRICHLOROBENTADIENE
4-CHLORO-3-METHYLPHENOL
2,4-DIMETHYLPHENOL
2,4-G-TRICHLOROPHENOL
2,4-G-TRICHLOROPHENOL
2,4-G-TRICHLOROPHENOL
2,4-G-TRICHLOROPHENOL
2,4-G-TRICHLOROPHENOL
2,4-G-TRICHLOROPHENOL
2,1-S-TRICHLOROPHENOL
2,2-NITROANILINE
3,2-NITROANILINE
4,1-S-TRICHLOROPHENOL
2,2-NITROANILINE
4,1-S-TRICHLOROPHENOL
2,2-NITROANILINE
3,2-NITROANILINE
4,1-S-TRICHLOROPHENOL
3,2-NITROANILINE
4,1-S-TRICHLOROPHENOL
3,2-NITROANILINE
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FOOTNOTES
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SAMPLE AND ANALYSIS MANAGEMENT EPA-REGION IV ESD. ATHENS,	* * * * * * * * * * * * * * * * * * *	SAS NO.: * * * * * * * * * * * * * * * * * * *				
	ACIABLE UNGANICS DAIA REPUR * * * * * * * * * * * * * * * * * * *	NO.: 15099 * * * * * * * * * * * * * * * * * * *	PHENOL BIS(2-CHLOROETHYL) ETHER 2-CHLOROPHENOL 1,3-DICHLOROBENZENE BENZYL ALCOHOL 1,2-DICHLOROBENZENE BENZYL ALCOHOL 1,2-DICHLOROBENZENE 2-METHYLPHENOL BIS(2-CHLORO)SOPROPYL) ETHER (3-AND/OR 4-)METHYLPHENOL N-NITROSODI-N-PROPYLAMINE HEXACHLOROETHANE 1SOPHORONE 2-NITROPHENOL BENZOL 1-2,4-DIMETHYLPHENOL BENZOL 2-A-DIMETHYLPHENOL BENZOL 1-2,4-TRICHLOROBENZENE 1-2,4-TRICHLOROPHENOL 2-A-TRICHLOROPHENOL BIS(2-CHLORO-3-METHYLPHENOL 2-4-TRICHLOROPHENOL 2-4-TRICHLOROPHENOL 2-METHYLNAPHTHALENE PEXACHLOROSOPHENOL 2-4-G-TRICHLOROPHENOL 2-4-G-TRICHLOROPHENOL 2-4-G-TRICHLOROPHENOL 2-4-G-TRICHLOROPHENOL 2-4-G-TRICHLOROPHENOL 2-4-G-TRICHLOROPHENOL 2-4-G-TRICHLOROPHENOL 2-4-G-TRICHLOROPHENOL 2-4-G-TRICHLOROPHENOL 2-4-G-TRICHLOROPHENOL 2-4-G-TRICHLOROPHENOL 2-4-G-TRICHLOROPHENOL 2-4-G-TRICHLOROPHENOL 2-4-G-TRICHLOROPHENOL 2-4-G-TRICHLOROPHENOL 2-CHLOROPHENOL	ጀ″ # × # * * * *	CASE * * * UG/L	255555555555555555555555555555555555555

REMARKS

FOOTNOTES
*A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*A-AVERAGE VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *LACTUAL VALUE IS KNOWN TO BE TECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND WAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

REMARKS

EXTRACTABLE ORGANICS DATA REPORT

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***FOOTNOTES***

*A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE

*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE

*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LINIT

*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NEC
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BENZYL ALCOHOL
1,2-DICHLOROBENZENE
1,2-DICHLOROBENZENE
2-METHYLPHENOL
N-NITROSODI-N-PROPYL AMINE
HEXACHLOROETHANE
NITROBENZENE
1SOPHORONE
2-NITROPHENOL
2,4-DIMETHYLPHENOL
2,4-DICHLOROETHOXY) METHANE
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2,4,5-TRICHLOROPHENOL
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4-NITROPHENOL
DIBENZOFURAN
U 2.4-DINITROTOLUENE
U 1-CHLOROPHENYL PHTHALATE
4-CHLOROPHENYL PHENYL ETHER
U 1-NITROANILINE
U 2-METHYL-4.6-DINITROPHENOL
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FOOTNOTES

*A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS *NOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS THE MINIMUM *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM *R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. F VALUE *N-PRESUMPTIVE EVIDENCE KNOWN TO BE GREATER THAN VALUE A QUANTITATION LIMIT.
RESAMPLING AND REANALYSIS IS NE NECESSARY OF PRESENCE GIVEN FOR VERIFICATION 유 MATERIAL

FOOTNOTES

*A-AVERAGE VALUE
*K-ACTUAL VALUE II
*U-WATERIAL WAS AI
*R-QC INDICATES TI *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NEW NECESSARY OF PRESENCE GIVEN FOR **VERIFICATION** MATERIAL

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD, ATHENS, GA. E ORGANICS DATA REPORT	* * * * * * * * * * * * * * * * * * *	SAS NO.: D.	10000UR 3-NITROANILINE 2100U ACENAPHTHENE 1 2-CHLOROPHENOL 1 3-DICHLOROBENZENE	21000 21000 21000 21000	21000 100001 100001	22.2.2.2.2.2.2.2.2.2.2.2.2.2.2.2.2.2.2	2000 2100U	22.27 21001 21001	2427 2001 2001	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	22.22.2 20012	DIMETHYL PHTHALATE 2100U BENZO(GHI)PERYLENE ACENAPHTHYLENE 2.6-DINITROTOLUENE
EXTRACTABLE ORGANIC	PROJECT NO. 91 SOURCE: AMAX P STATION ID: SD	CASE NO.: 15099 * * * * * * * * UG/KG	2100U PHENOL 2100U BIS(2-CHL 2100U 2-CHLOROP 2100U 1,3-DICHL	2100U 1,4-DICHL 2100U BENZYL AL 2100U 1,2-DICHL 2100U 3-MFTHVIP	2100UR BIS(2-CHL 2100U (3-AND/OR 2100U N-NITROSO	2100U HEXACHLOR 2100UR NITROBENZ 2100U ISOPHORON	2100U 2-NITROPH 2100U 2,4-DIMET 10000U BENZOIC A	21000 BIS(2-CHL 21000 2,4-DICHL 10008 1,9-4-TRI	21000 NAPHTHALE 21000 4-CHLOROA 21000 HEXACHLOR	2100U 4-CHLORO- 2100U 2-METHYLN 2100U HEXACHLOR	16000U 2,4,5-TRI 2100UR 2-CHLORON 10000U 2-NITROAN	
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REMARKS

FOOTNOTES
*A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*A-AVERAGE VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

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D. NO.: Y327 * * * * * * * * * * * * * * * * * * *	50U 3-NITROANILINE 10U ACENAPHTHENE 50U 4-NITROPHENOL 50U 4-NITROPHENOL 10U DIEBNZOFURAN 10U 2.4-DINITROPHENOL 10U DIETHYL PHTHALATE 10U 4-CHLOROPHENYL PHENYL ETHER 10U 4-CHLOROPHENYL PHENYL ETHER 50U 2-METHYL-4.6-DINITROPHENOL 10U N-NITROSODIPHENYL BHENYL ETHER 10U 4-BROMOPHENYL PHENYL ETHER 10U HEXACHLOROPHENOL 10U PENTACHLOROPHENOL 10U PHENANTHENE 10U PYRENE 10U PYRENE 10U PYRENE 10U PYRENE 10U PYRENE 10U PYRENE 10U PYRENE 10U PYRENE 10U PYRENE 10U BENZOLA)ANTHRACENE 10U BENZOLA)ANTHRACENE 10U BENZOLA)ANTHRACENE 10U BENZOLA)ANTHRACENE 10U BENZOLA)ANTHRACENE 10U BENZOLA)ANTHRACENE 10U BENZOLA)ANTHRACENE 10U BENZOLA-PYRENE 10U BENZOLA-PYRENE 10U BENZOLA-PYRENE 10U BENZOLA-PYRENE
CASE NO.: 15099 * * * * * * * * * * * * * * * * * * *	100 PHENOL 100 BIS (2-CHLOROETHYL) ETHER 100 1-3-DICHLOROBENZENE 100 1-3-DICHLOROBENZENE 100 1-2-DICHLOROBENZENE 100 1-2-DICHLOROBENZENE 100 2-METHYLPHENOL 100 2-METHYLPHENOL 100 N-NITROSOBI-N-PROPYLAMINE 100 N-NITROSOBI-N-PROPYLAMINE 100 2-ALDINTROPHENOL 100 2-A-DIMETHYLPHENOL 100 2-A-DIMETHYLPHENOL 100 2-A-DICHLOROPHENOL 100 2-A-DICHLOROPHENOL 100 2-A-DICHLOROPHENOL 100 2-A-DICHLOROPHENOL 100 2-A-DICHLOROPHENOL 100 2-A-DICHLOROPHENOL 100 2-A-DICHLOROPHENOL 100 2-A-CHLOROBULANE 100 4-CHLOROBULANE 100 4-CHLOROBULANE 100 4-CHLOROBULANE 100 4-CHLOROBULANE 100 4-CHLOROBULANE 100 2-A-G-TRICHLOROPHENOL 100 2-A-G-TRICHLOROPHENOL 100 2-A-G-TRICHLOROPHENOL 100 2-A-G-TRICHLOROPHENOL 100 2-A-G-TRICHLOROPHENOL 100 2-CHLORONAPHITALENE

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*A-AVERAGE VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
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REMARKS

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD, ATHENS, GA. 01/04/91	* * * * * * * * * * * * * * * * * * *	CASE NO.: 15099	Phenol
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FOOTNOTES
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FOOTNOTES
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*A-AVERAGE VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
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REMARKS

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*A-ACTUAL VALUE II

*U-MATERIAL WAS AN

*R-QC INDICATES TO *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

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THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NEW NECESSARY OF PRESENCE GIVEN FOR **VERIFICATION** 유 MATERIAL

EXTRACTABLE ORGANICS DATA *** * * * * * * * * *

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***FOOTNOTES***

*A-AVERAGE VALUE

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                                                                                                                                                                                                                                                          2-CHLOROPHENOL
1,3-DICHLOROBENZENE
1,4-DICHLOROBENZENE
BENZYL ALCOHOL
1,2-DICHLOROBENZENE
1,2-DICHLOROBENZENE
BIS(2-CHLOROISOPROPYL) ETHER
(3-AND/OR 4-)METHYLPHENOL
N-NITROSODI-N-PROPYLAMINE
HEXACHLOROETHANE
NITROBENZENE
1SOPHORONE
2-NITROPHENOL
BENZOIC ACID
BENZOIC ACID
BENZOIC ACID
BIS(2-CHLOROETHOXY) METHANE
1,2,4-DICHLOROPHENOL
DENZOIC ACID
A-CHLOROPHENOL
1,2,4-TRICHLOROBENZENE
U-CHLOROANILINE
HEXACHLOROBUTADIENE
U-A-CHLOROPHENOL
2-METHYLNAPHTHALENE
U-A-G-TRICHLOROPHENOL
REXACHLOROCYCLOPENTADIENE
U-A-G-TRICHLOROPHENOL
REXACHLOROROPHENOL
2-4,5-TRICHLOROPHENOL
REXACHLOROAPHTHALENE
U-CHLORONAPHTHALENE
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TYPE:
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UG/KG
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U 2.4-DINITROPHENOL

2.4-DINITROPHENOL

DIBENZOFURAN

U 2.4-DINITROTOLUENE

DIETHYL PHTHALATE

4-CHLOROPHENYL PHENYL ETHER

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U BENZYL BUTYL PHTHALATE

U BENZYL ANTHRACENE

U BENZYL ANTHRACENE

U BENZO(A) ANTHRACENE

U BENZO(B AND/OR K) FLUORANTHENE

BENZO(A, H) ANTHRACENE

U BENZO(A, H) ANTHRACENE

U BENZO(GHI) PERYLENE
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                                         MATERIAL
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***FOOTNOTES***

*A-AVERAGE VALUE

*K-ACTUAL VALUE I

*U-MATERIAL WAS A

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                                                                                                                                                                                                                                                                                                                                     PROJECT NO. 91-025
SOURCE: AMAX PHOSPHATE
STATION ID: MW-03
                                                                                                                                                                                                                                                                                                                             PHENOL
BIS(2-CHLOROPHENOL
1,3-DICHLOROBENZENE
1,3-DICHLOROBENZENE
1,4-DICHLOROBENZENE
1,2-DICHLOROBENZENE
1,2-DICHLOROBENZENE
1,2-METHYLPHENOL
BIS(2-CHLOROISOPROPYL) ETHER
(3-ND/OR 4-)METHYLPHENOL
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2.4-DINITROPHENOL

4.-NITROPHENOL

2.4-DINITROPHENOL

DIBENZOFURAN

2.4-DINITROTOLUENE

DIETHYL PHTHALATE

4-CHLOROPHENYL PHENYL ETHER

FLUORENE

4-NITROANILINE

1.2-METHYL-4,6-DINITROPHENOL

2.4-METHYL-7,6-DINITROPHENOL

1.4-BROMOPHENYL PHENYL ETHER

4-BROMOPHENYL PHENYL ETHER

HEXACHLOROBENZENE (HCB)

PENTACHLOROBENZENE (HCB)

PENTACHLOROBENZENE

JOI-N-BUTYL PHTHALATE

BENZYL BUTYL PHTHALATE

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U BENZYL BUTYL PHTHALATE

U BENZYL BUTYL PHTHALATE

U BENZYL A-PYRENE

U BUTYL PHTHALATE

U BIS(2-ETHYLHEXYL) PHTHALATE

U BENZO(A) AND/OR K) FLUORANTHENE

U BENZO(A) AND/OR K) FLUORANTHENE

U BENZO(A, H) ANTHRACENE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           NO.: Y328
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ANALYTICAL
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*NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NEW NECESSARY FOR VERIFICATION MATERIAL

XTRACTABLE ORGANICS DATA REPORT ** * * * * * * * * * * * * * * * * * *	GA.	01/04/91
TYPE:	PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1045 STOP: 00/00/00	* * * *
** CASE NO.: 15099 *** * * * * * * * * * * * * * * * * *	D. NO.: Y150 * * * * * * * * * * * * * * * * * * *	* * *
10000 PHENOL 1200U BIS(2-CHLOROETHYL) ETHER 1200U 2-CHLOROPHENOL 1200U 1.3-DICHLOROBENZENE	5900UR 3-NITROANILINE 1200U ACENAPHTHENE 5900U 2,4-DINITROPHENOL 5900U 4-NITROPHENOL	
1200U 1,4-DICHLOROBENZENE 1200U BENZYL ALCOHOL 1200U 1,2-DICHLOROBENZENE	1200U DIBENZOFURAN 1200U 2,4-DINITROTOLUENE 1200U DIETHYL PHTHALATE	
1200U Z-MEIHYLPHENOL 1200UR BIS(2-CHLOROISOPROPYL) ETHER 1200U AJAND/OR 4-)METHYLPHENOL	12000 4-CHLURUPHENYL PHENYL EIMER 12000 4-NITOANILINE 50001 9-NETUXI 4 6-DINITORDENOI	
1200U HEXBENDETHANE 1200UR NITROBENSENE 1200UR NITROBENSENE	1200U A-BROMOPHENYL BITHER 1200U A-BROMOPHENYL PHENYL ETHER 1200U HEXACHIORORFIZER (HCR)	
1200U 2-NITROPHENOL 1200U 2,4-DIMETHYLPHENOL	5900U PENTACHLOROPHENOL 1200U PHENANTHRENE 1200U ANTHRENE	
1200U BIS(2—CHLOROETHOXY) METHANE 1200U 2,4-DICHLOROPHENOL	1200U DIN-BUTYLPHTHALATE 1200U FLUORANTHENE	
12000K 1.2.4-IKICHLOKOBENZENE 1200U NAPHTHALENE 1200U H-CHLOROMILINE	1200U PYKENE 1200U BENZYL BUTYL PHTHALATE 2400U 3,3'4'-DICHLOROBENZIDINE	
1200U 4-CHLORO-3-METHYLPHENOL 1200U 2-METHYLNAPHTHALENE	1200U CHRYSENE 1200U BIS(2-ETHYLL) PHTHALATE	
1200U HEXACHLORUCYCLOPENIADIENE (HCCP) 1200U 2.4.6—TRICHLOROPHENOL 5000II 2.4.5—TRICHIOROPHENOL	1200U DI-N-UCIYLPHIHALAIE 1200U BENZO(B AND/OR K)FLUORANTHENE 1200II RENZO-A-PYRENE	
1200UR 2-CHLORONAPHTHALENE 5900U 2-NITROANILINE	1200U INDENO (1, 2, 3-CD) PYRENE 1200U DIBENZO(A, H)ANTHRACENE	
	1200U BENZO(GHI)PERYLENE 46 PERCENT MOISTURE	

REMARKS

FOOTNOTES
*A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*A-AVERAGE VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
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EXTRACTABLE ORGANICS DATA *** * * * * * * * * *

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REMARKS

REMARKS

FOOTNOTES

*A-AVERAGE VALUE

*K-ACTUAL VALUE II

*U-MATERIAL WAS AI

*R-QC INDICATES TI *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

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REMARKS

REMARKS

FOOTNOTES

*A-AVERAGE VALUE IS

*K-ACTUAL VALUE IS

*U-MATERIAL WAS AN

*R-QC INDICATES TO *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

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01/04/91

PROJECT NO. 91-025 SAMPLE NO. 51643 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON ** SOURCE: AMAX PHOSPHATE FACIL STATION ID: SD-05 CITY: PALMETTO ** ST: FL ** COLLECTION START: 10/15/90 1655 STOP: 00/00/00 * * ** MD NO: Y168 ** CASE.NO.: 15099 SAS NO.: D. NO.: Y168 * * ** * *

ANALYTICAL RESULTS UG/KG

3000J 3 UNIDENTIFIED COMPOUNDS

MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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01/04/91

MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1630 STOP: 00/00/00 PROJECT NO. 91-025 SAMPLE NO. 51645 SAMPLE TYPE: ** SOURCE: ** * * STATION ID: SD-04 ** ** CASE.NO.: 15099 SAS NO.: MD NO: Y166 ** D. NO.: Y166 ** ** **

ANALYTICAL RESULTS UG/KG

2000J 1 UNIDENTIFIED COMPOUND

^{*}A-AVERAGE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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01/04/91

MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51646 SAMPLE TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON ** CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1620 STOP: 00/00/00 D. NO.: Y167 MD NO: Y167 SOURCE: AMAX PHOSPHATE FACIL * * ** STATION ID: SW-04 ** ** CASE .NO .: 15099 SAS NO.: ** ** ** **

ANALYTICAL RESULTS UG/L

BROMACIL 4JN

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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01/04/91

PROJECT NO. 91-025 SAMPLE NO. 51647 SAMPLE TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON SOURCE: AMAX PHOSPHATE FACIL STATION ID: SW-08 CASE.NO.: 15099 SAS NO.: PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1605 STOP: D. NO.: Y165 MD NO: Y165 ** * * CITY: PALMETTO ST: FL

COLLECTION START: 10/17/90 1605 STOP: 00/00/00

D. NO.: Y165 MD NO: Y165 ** ** ** ** * * * * ** * *

ANALYTICAL RESULTS UG/L

4JN BROMACIL

MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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01/04/91

MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT PROG ELEM: NSF COLLECTED BY: M GORDON PROJECT NO. 91-025 SAMPLE NO. 51648 SAMPLE TYPE: SOIL ** CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1610 STOP: 00/00/00 SOURCE: AMAX PHOSPHATE FACIL * * ** STATION ID: SD-08 CASE.NO.: 15099 ** ** MD NO: Y164 SAS NO.: D. NO.: Y164 ** ** ** **

ANALYTICAL RESULTS UG/KG

500JN TETRAHYDRODIMETHYL (METHYLETHYL) NAPHTHALENE 7 UNIDENTIFIED COMPOUNDS 20000J

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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01/04/91

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MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51649 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON ** SOURCE: AMAX PHOSPHATE FACIL **

CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1505 STOP: 00/00/00 D. NO.: Y159 MD NO: Y159

ANALYTICAL RESULTS UG/KG

50000J 17 UNIDENTIFIED COMPOUNDS PETROLEUM PRODUCT

SAS NO.:

FOOTNOTES

STATION ID: SD-11

CASE NO.: 15099

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^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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01/04/91

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MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT

PROJECT NO. 91-025 SAMPLE NO. 51650 SAMPLE TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON

SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO ST:_FL

STATION ID: SW-11 COLLECTION START: 10/17/90 1445 STOP: 00/00/00 MD NO: Y158 CASE NO.: 15099 SAS NO.: D. NO.: Y158

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ANALYTICAL RESULTS UG/L

7JN TETRADECANOIC ACID HEXADECANOIC ACID 10JN

FOOTNOTES

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^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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01/04/91

MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51651 SAMPLE TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON ** SOURCE: AMAX PHOSPHATE FACIL STATION ID: SW-09 CASE.NO.: 15099 SAS CITY: PALMETTO ST: FL
COLLECTION START: 10/17/90 1515 STOP: 00/00/00
D. NO.: Y163 MD NO: Y163 ** * * ** ** SAS NO.: ** * * ** **

ANALYTICAL RESULTS UG/L

10JN **HEXADECANOIC ACID** 5JN HYDROXYMETHOXYBENZALDEHYDE 4 UNIDENTIFIED COMPOUNDS 60J PETROLEUM PRODUCT

FOOTNOTES *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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01/04/91

MISCELLANEOUS EXTRACTABLE COMPOUNDS ~ DATA REPORT PROG ELEM: NSF COLLECTED BY: M GORDON PROJECT NO. 91-025 SAMPLE NO. 51652 SAMPLE TYPE: SOIL * * CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1530 STOP: 00/00/00 SOURCE: AMAX PHOSPHATE FACIL ** ** STATION ID: SD-09 CASE.NO.: 15099 * * ** MD NO: Y162 SAS NO.: D. NO.: Y162 ** ** ** **

ANALYTICAL RESULTS UG/KG

5000J 2 UNIDENTIFIED COMPOUNDS DODECANOIC ACID 1000JN 400JN HEPTADECANOIC ACID 800JN OCTADECANOIC ACID

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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01/04/91

MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51653 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON ** CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1520 STOP: 00/00/00 SOURCE: AMAX PHOSPHATE FACIL * * ** STATION ID: SD-07 CASE.NO.: 15099 ** ** SAS NO.: D. NO.: Y160 MD NO: Y160 ** ** ** **

ANALYTICAL RESULTS UG/KG

PETROLEUM PRODUCT 2000JN TETRAHYDRODIMETHYL (METHYLETHYL) NAPHTHALENE DECAHYDROMETHYLMETHYLENE (METHYLETHYL) -1000JN NAPHTHALENOL HEXADECANOIC ACID 500JN 300JN BENZOFLUORENE 20000J 5 UNIDENTIFIED COMPOUNDS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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01/04/91

MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51656 SAMPLE TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON * * SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1440 STOP: 00/00/00 D. NO.: Y157 MD NO: Y157 * * * * ** STATION ID: SW-06 ** CASE.NO .: 15099 SAS NO.: ** ** * * **

ANALYTICAL RESULTS UG/L

100J 3 UNIDENTIFIED COMPOUNDS

^{*}A-AVERAGE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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01/04/91

MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51663 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON ** SOURCE: AMAX PHOSPHATE FACIL STATION ID: SS-04 CITY: PALMETTO ** ST: FL ** COLLECTION START: 10/18/90 1020 STOP: 00/00/00 ** CASE.NO.: 15099 SAS NO : MD NO: Y173 ** D. NO.: Y173 ** ** * *

ANALYTICAL RESULTS UG/KG

3000J 2 UNIDENTIFIED COMPOUNDS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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01/04/91

MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51666 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON PROG ELEM: NSF CULLECTED BY. M. GONDON ST. FL COLLECTION START: 10/18/90 0900 STOP: 00/00/00 NO.: Y170 MD NO: Y170 SOURCE: AMAX PHOSPHATE FACIL ** ** STATION ID: SS-05 CASE.NO.: 15099 ** * * SAS NO.: * * ** * * **

ANALYTICAL RESULTS UG/KG

4 UNIDENTIFIED COMPOUNDS 5000J PETROLEUM PRODUCT

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

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01/04/91

MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51667 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON ** CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1150 STOP: 00/00/00 D. NO.: Y153 MD NO: V153 SOURCE: AMAX PHOSPHATE FACIL ** ** STATION ID: SS-07 CASE.NO.: 15099 ** * * SAS NO.: ** ** ** **

ANALYTICAL RESULTS UG/KG

1 UNIDENTIFIED COMPOUND 1000J DODECANOIC ACID 2000JN 4000JN HEXADECANOIC ACID

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01/04/91

MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51668 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON SOURCE: AMAX PHOSPHATE FACIL ST: FL * * CITY: PALMETTO ** COLLECTION START: 10/17/90 1205 STOP: 00/00/00 D. NO.: Y152 MD NO: Y152 STATION ID: SS-06 ** CASE NO : 15099 SAS NO.: ** ** * * * *

ANALYTICAL RESULTS UG/KG

2000J 2 UNIDENTIFIED COMPOUNDS

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*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

01/04/91

MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51669 SAMPLE TYPE: SOIL ** PROG ELEM: NSF COLLECTED BY: M GORDON SOURCE: AMAX PHOSPHATE FACIL STATION ID: SD-12 ** CITY: PALMETTO ST: FL * * COLLECTION START: 10/17/90 1230 STOP: 00/00/00 ** ** CASE.NO.: 15099 SAS NO.: MD NO: Y154 ** D. NO.: Y154 **

* * * *

ANALYTICAL RESULTS UG/KG

HEXADECANOIC ACID 1000JN 3000J 2 UNIDENTIFIED COMPOUNDS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT. *R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

01/04/91

MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51670 SAMPLE TYPE: PROG ELEM: NSF COLLECTED BY: M GORDON * * CITY: PALMETTO ST: FL ** SOURCE: COLLECTION START: 10/17/90 1215 STOP: 00/00/00 D. NO.: Y155 MD NO: Y155 STATION ID: SB-06 ** ** CASE.NO.: 15099 SAS NO.: ** ** ** * *

ANALYTICAL RESULTS UG/KG

1000J 1 UNIDENTIFIED COMPOUND

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

01/04/91

PROJECT NO. 91-025 SAMPLE NO. 51671 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON ** SOURCE: AMAX PHOSPHATE FACIL STATION ID: SB-03 CASE.NO.: 15099 SAS CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1135 STOP: 00/00/00 D. NO.: Y149 MD NO: Y149 ** ** * * * * SAS NO.: ** * * ** **

ANALYTICAL RESULTS UG/KG

2000J 2 UNIDENTIFIED COMPOUNDS

MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
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01/04/91

MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51673 SAMPLE TYPE: GROUNDWA PROG ELEM: NSF COLLECTED BY: M GORDON SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO ST: FL ** * * COLLECTION START: 10/16/90 1130 STOP: 00/00/00 D. NO.: Y326 MD NO: Y326 ** STATION ID: MW-01 ** CASE.NO.: 15099 SAS NO.: ** ** * *

ANALYTICAL RESULTS UG/L

10JN DIETHYLMETHYLBENZAMIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
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01/04/91

SAMPLE NO. 51675 SAMPLE TYPE: SOIL PROJECT NO. 91-025 PROG ELEM: NSF COLLECTED BY: M GORDON ** SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO ST: FL ** ** COLLECTION START: 10/16/90 1335 STOP: 00/00/00 D. NO.: Y136 MD NO: Y136 ** STATION ID: SD-01 ** CASE.NO.: 15099 SAS NO.: ** ** ** **

ANALYTICAL RESULTS UG/KG

MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT

2000J 2 UNIDENTIFIED COMPOUNDS 600JN HEXADECANOIC ACID 300JN ANTHRACENEDIONE BENZOFLUORENE 300JN 200JN BENZOFLUORANTHENE (NOT B OR K) 500JN BENZACEPHENANTHRYLÈNE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
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01/04/91

MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51676 SAMPLE TYPE: GROUNDWA PROG ELEM: NSF COLLECTED BY: M GORDON * * SOURCE: AMAX PHOSPHATE FACIL ** CITY: PALMETTO ST: FL ** COLLECTION START: 10/16/90 1350 STOP: 00/00/00 ** STATION ID: MW-05 ** CASE.NO.: 15099 SAS NO.: MD NO: Y329 ** D. NO.: Y329 ** ** * *

ANALYTICAL RESULTS UG/L

OCTANOIC ACID DECANOIC ACID 5JN BIS(HYDROXYETHYL)DODECANAMIDE BUTYLIDENEBISDIMETHYLETHYLMETHYLPHENOL 30JN **10JN** 100J 3 UNIDENTIFIED COMPOUNDS

FOOTNOTES *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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01/04/91

MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51678 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON ** SOURCE: AMAX PHOSPHATE FACIL ** CITY: PALMETTO ST: FL ** COLLECTION START: 10/16/90 1420 STOP: 00/00/00 ** STATION ID: SD-02 * * CASE.NO.: 15099 SAS NO.: MD NO: Y140 ** D. NO.: Y140 ** * * * *

ANALYTICAL RESULTS UG/KG

50000J 15 UNIDENTIFIED COMPOUNDS

PETROLEUM PRODUCT 1000JN HEXADECANOIC ACID

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
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*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

01/04/91

MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT PROG ELEM: NSF COLLECTED BY: M GORDON PROJECT NO. 91-025 SAMPLE NO. 51679 SAMPLE TYPE: GROUNDWA CITY: PALMETTO ST: FL COLLECTION START: 10/16/90 1520 STOP: 00/00/00 D. NO.: Y327 MD NO: Y327 SOURCE: AMAX PHOSPHATE FACIL * * * * STATION ID: MW-04 ** ** CASE.NO.: 15099 SAS NO.: ** ** ** **

ANALYTICAL RESULTS UG/L

100JN CAPROLACTAM BUTYLIDENBISDIMETHYLETHYLMETHYLPHENOL 20JN 1 UNIDENTIFIED COMPOUND 20J

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

01/04/91

PROJECT NO. 91-025 SAMPLE NO. 51680 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON ** SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO ST: FL ** ** STATION ID: SS-01 COLLECTION START: 10/16/90 1520 STOP: 00/00/00 ** ** CASE.NO.: 15099 MD NO: Y138 SAS NO.: D. NO.: Y138 ** * * * * **

ANALYTICAL RESULTS UG/KG

L0008 5 UNIDENTIFIED COMPOUNDS

MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

01/04/91

MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51682 SAMPLE TYPE: GROUNDWA PROG ELEM: NSF COLLECTED BY: M GORDON * * SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO ST: FL COLLECTION START: 10/16/90 1615 STOP: 00/00/00 D. NO.: Y143 MD NO: Y143 ** ** STATION ID: MW-06 ** CASE.NO.: 15099 SAS NO.: * * ** * * **

ANALYTICAL RESULTS UG/L

70JN CAPROLACTAM

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

01/04/91

MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51685 SAMPLE TYPE: SOIL PROG ELEM: NSF ** COLLECTED BY: M GORDON SOURCE: AMAX PHOSPHATE FACIL ST: FL ** CITY: PALMETTO * * COLLECTION START: 10/17/90 0925 STOP: 00/00/00 D. NO.: Y144 MD NO: Y144 STATION ID: SS-02 ** CASE .NO .: 15099 SAS NO.: ** ** * * * *

ANALYTICAL RESULTS UG/KG

PETROLEUM PRODUCT 3000J 2 UNIDENTIFIED COMPOUNDS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

01/04/91

PROJECT NO. 91-025 SAMPLE NO. 51686 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO ST: FL ** ** COLLECTION START: 10/17/90 0945 STOP: 00/00/00 STATION ID: SB-02 * * ** CASE.NO.: 15099 MD NO: Y145 ** SAS NO.: D. NO.: Y145 ** ** **

ANALYTICAL RESULTS UG/KG

800J 1 UNIDENTIFIED COMPOUNDS

MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
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01/04/91

MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT SAMPLE NO. 51687 SAMPLE TYPE: GROUNDWA PROJECT NO. 91-025 PROG ELEM: NSF COLLECTED BY: M GORDON ** SOURCE: AMAX PHOSPHATE FACIL ST: FL * * CITY: PALMETTO ** COLLECTION START: 10/17/90 0900 STOP: 00/00/00 ** STATION ID: MW-03 ** CASE.NO.: 15099 SAS NO.: D. NO.: Y328 MD NO: Y328 * * ** * * * *

ANALYTICAL RESULTS UG/L

20JN BUTYLIDENEBISDIMETHYLETHYLMETHYLPHENOL OCTANOIC ACID 5JN

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT. *R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

01/04/91

MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51688 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON ** SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO ST: FL ** CÔLLECTION START: 10/17/90 1045 STOP: 00/00/00 D. NO.: Y150 MD NO: Y150 STATION ID: SD-10 ** * * CASE.NO.: 15099 SAS NO.: ** ** * * * *

ANALYTICAL RESULTS UG/KG

30000J 4 UNIDENTIFIED COMPOUNDS 3000JN 20000JN 700JN PHENYLETHANONE DODECANOIC ACID TETRADECANOIC ACID 20000JN HEXADECANOIC ACID 2000JN PHENYLTRICYCLONONADIENOL 6000JN DIPHENYLPROPANEDIONE 4000JN OCTADECANOIC ACID

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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01/04/91

MISCELLANEOUS EXTRACTABLE COMPOUNDS - DATA REPORT SAMPLE NO. 51689 SAMPLE TYPE: SOIL PROJECT NO. 91-025 PROG ELEM: NSF COLLECTED BY: M GORDON SOURCE: AMAX PHOSPHATE FACIL ST: FL CITY: PALMETTO ** COLLECTION START: 10/17/90 1020 STOP: 00/00/00 * * STATION ID: SS-03 ** * * CASE . NO .: 15099 SAS NO.: D. NO.: Y148 MD NO: Y148 ** ** **

ANALYTICAL RESULTS UG/KG

8000J 6 UNIDENTIFIED COMPOUNDS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
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*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

UNITED STATES ENVIRONMENTAL PROTECTION AGEN Region IV

Environmental Services Division College Station Road, Athens, Ga. 30613



****MEMORANDUM*****

DATE: 01/05/91

SUBJECT: Results of Pesticide/PCB Analysis;

91-025 AMAX PHOSPHATE FACIL

PALMETTO FL CASE NO: 15099

FROM: Robert W. Knight

Chief, Laboratory Evaluation/Quality Assurance Section

TO: PHIL BLACKWELL

Attached are the results of analysis of samples collected as part of the subject project.

As a result of the Quality Assurance Review, certain data qualifiers may have been placed on the data. Attached is a DATA QUALIFIER REPORT which explains the reasons that these qualifiers were required.

If you have any questions please contact me.

ATTACHMENT

ORGANIC DATA QUALIFIER REPORT

Case Number 15099 Project

Project Number 91-025

SAS Number

Site ID. Amax Phosphate Facil, Palmetto, FL.

Affected Samples	Compound or Fraction	Flag <u>Used</u>	Reason
Volatiles DY143,157,158,161 163,165,167,169, 172,175,327-329 DY158	, 2-butanone carbon disulfide	R J	low response factor <quantitation limit<="" td=""></quantitation>
Extractables all samples DY146 Pesticides	di-n-butylphthalate benzo(a)anthracene all positives	J J	low QC spike recovery low QC spike recovery <quantitation limit<="" td=""></quantitation>

<u>Pesticides</u> none

ORGANIC DATA QUALIFIER REPORT

Case Number 15099

Project Number

91-025

SAS Number

Site ID. Amax Phosphate Facil, Palmetto, FL.

Affected Samples	Compound or Fraction	Flag <u>Used</u>	Reason
<u>Volatiles</u> DY173,170,152,155 140,138,144	all positives	J	<quantitation limit<="" td=""></quantitation>
Extractables all samples bis	(2-chloroisopropyl)ether	R u	nacceptable recovery blind spike
•	nitrobenzene	R u	nacceptable recovery blind spike
	1,2,4-trichlorobenzene	R	unacceptable recovery blind spike
	2-chloronaphthalene	R	unacceptable recovery blind spike
D:::1 (0 1 (0 1 0 (3-nitroaniline	R	unacceptable recovery blind spike
DY168,160,136	phenanthrene	J J J	<quantitation limit<="" td=""></quantitation>
DY168,136	pyrene	J	<quantitation limit<="" td=""></quantitation>
DY168,160,136	benzo(a)anthracene	J	<quantitation limit<="" td=""></quantitation>
	chrysene	J	<quantitation limit<="" td=""></quantitation>
	benzo(b)fluoranthene	J	<pre><quantitation limit<="" pre=""></quantitation></pre>
DY164,159,170,153	benzo(a)pyrene all positives	J J	<pre><quantitation <quantitation="" limit="" limit<="" pre=""></quantitation></pre>
DY160	acenaphthene	J	<pre><quantitation limit<="" pre=""></quantitation></pre>
DY160,136	anthracene	Ĵ	<pre><quantitation limit<="" pre=""></quantitation></pre>
D1100,150	indeno(1,2,3-cd)pyrene	Ĵ	<pre><quantitation limit<="" pre=""></quantitation></pre>
DY136	benzo(g,h,i)perylene	.T	<pre><quantitation limit<="" pre=""></quantitation></pre>
DY150	benzoic acid	J J	<pre><quantitation limit<="" pre=""></quantitation></pre>
DY160	acenaphthene	Ĵ	low response factor but present
DY156,159,162,164		•	Ion responde radios and prosent
166,168,170,171,	•		
173,174	acenaphthene	R	low response factor
Pesticides			
DY144	alpha-Chlordane	J	<quantitation limit<="" td=""></quantitation>
	gamma-Chlordane	Ĵ	<quantitation limit<="" td=""></quantitation>

01/04/91

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PESTICIDES/PCB'S DATA REPORT
*** PROJECT NO. 91-025 SAMPLE NO. 51642 SAMPLE TYPE: GROUNDWA PROG ELEM: NSF COLLECTED BY: M GORDON ***

*** SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO ST: FL ***
                                                                                                                                  ** .
                                                                      COLLECTION START: 10/15/90 0630 STOP: 00/00/00 D. NUMBER: Y325
     STATION ID: PB-01
CASE NUMBER: 15099
**
                                                                                                                                  * *
* *
                                 SAS NUMBER:
                                                                                                                                  **
                                                                                                                                  * *
UG/L
                        ANALYTICAL RESULTS
                                                                      UG/L
                                                                                          ANALYTICAL RESULTS
  O. OSOU ALPHA-BHC
                                                                     0.50U METHOXYCHLOR
  0.050U BETA-BHC
                                                                            ENDRIN KETONE
                                                                     0.100
                                                                            CHLORDANE (TECH. MIXTURE) /1
GAMMA-CHLORDANE /2
  0.0500
          DELTA-BHC
          GAMMA-BHC (LINDANE)
  0.0500
                                                                     0.500
  0.0500
          HEPTACHLOR
                                                                     0.50U
                                                                             ALPHA-CHLORDANE
  0.0500
          ALDRIN
                                                                            TOXAPHENE
                                                                      1.00
          HEPTACHLOR EPOXIDE
  0.0500
                                                                     0.500
                                                                            PCB-1016 (AROCLOR 1016)
          ENDOSULFAN I (ALPHA)
  0.0500
                                                                            PCB-1221 (AROCLOR 1221)
                                                                     0.500
          DIELDRIN
                                                                            PCB-1232 (AROCLOR 1232)
   0.100
                                                                     0.500
                                                                            PCB-1242 (AROCLOR 1242)
   0.100
          4,4'-DDE (P,P'-DDE)
                                                                     0.500
                                                                            PCB-1248 (AROCLOR 1248)
PCB-1254 (AROCLOR 1254)
PCB-1260 (AROCLOR 1260)
          ENDRIN
   0.100
                                                                     0.500
   0.100
          ENDOSULFAN II (BETA)
                                                                      1.00
   0.100
          4,4'-DDD (P,P'-DDD)
                                                                      1.00
   0.300
          ENDOSULFAN SULFATE
   0.100
          4.4'-DDT (P.P'-DDT)
```

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.
*C-CONFIRMED BY GCMS 1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

01/04/91 PESTICIDES/PCB'S DATA REPORT ** PROJECT NO. 91-025 SAMPLE NO. 51643 SAMPLE TYPE: SOIL

** SOURCE: AMAX PHOSPHATE FACIL

** STATION ID: SD-05

** COLLECTION START: 10/15/90 1655 STOP: 00/00/00 *** * *,

CASE NUMBER: 15099 SAS NUMBER: D. NUMBER: Y168 ** ** ** **

ANALYTICAL RESULTS UG/KG ANALYTICAL RESULTS UG/KG

21U ALPHA-BHC 210U METHOXYCHLOR 210 BETA-BHC 210 DELTA-BHC ENDRIN KETONE 43U CHLORDANE (TECH. MIXTURE) /1
GAMMA-CHLORDANE /2 21Ŭ GAMMA-BHC (LINDANE) 2100 HEPTACHLOR 2100 ALPHA-CHLORDANE 300 TOXAPHENE ALDRIN 210 430U PCB-1016 (AROCLOR 1016) PCB-1221 (AROCLOR 1221) HEPTACHLOR EPOXIDE 210 210U ENDOSULFAN I (ALPHA) 210 2100

PCB-1221 (AROCLOR 1221) PCB-1232 (AROCLOR 1232) PCB-1242 (AROCLOR 1242) PCB-1248 (AROCLOR 1248) PCB-1254 (AROCLOR 1254) PCB-1260 (AROCLOR 1260) DIELDRIN 43U 2100 43U 4,4'-DDE (P,P'-DDE) 2100 43U ENDRIN 2100 ENDOSULFAN II (BETA) 43U 430U 4,4'-DDD (P.P'-DDD) 43U 430U

ENDOSULFAN SULFATE PERCENT MOISTURE 43U 4.4'-DDT (P.P'-DDT)

REMARKS ***REMARKS***

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN

*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

*C-CONFIRMED BY GCMS

1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

01/04/91

PESTICIDES/PCB'S DATA REPORT		0.,0.,0.
*** * * * * * * * * * * * * * * * * *	SAS NUMBER: COLLECTION START: 10/17/90 1645 ST D. NUMBER: Y169	OON ***
UG/L ANALYTICAL	L RESULTS UG/L ANALYTICAL RESULT	: * * * * * * * * * * * * * * * * * * *
O.O5OU ALPHA-BHC O.O5OU BETA-BHC O.O5OU DELTA-BHC O.O5OU DELTA-BHC O.O5OU HEPTACHLOR O.O5OU ALDRIN O.O5OU HEPTACHLOR EPOXIDE O.O5OU ENDOSULFAN I (ALPHA) O.1OU DIELDRIN O.1OU 4,4'-DDE (P,P'-DDE) O.1OU ENDRIN O.1OU ENDRIN O.1OU ENDOSULFAN II (BETA) O.1OU 4,4'-DDD (P,P'-DDD) O.2OU ENDOSULFAN SULFATE O.1OU 4,4'-DDT (P,P'-DDT)	0.50U METHOXYCHLOR 0.10U ENDRIN KETONE CHLORDANE (TECH. MIXTURE) /1 0.50U GAMMA-CHLORDANE /2 1.0U TOXAPHENE 0.50U PCB-1016 (AROCLOR 1016) 0.50U PCB-1221 (AROCLOR 1221) 0.50U PCB-1232 (AROCLOR 1222) 0.50U PCB-1242 (AROCLOR 1242) 0.50U PCB-1248 (AROCLOR 1242) 0.50U PCB-1248 (AROCLOR 1248) 1.0U PCB-1254 (AROCLOR 1254) 1.0U PCB-1260 (AROCLOR 1260)	

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.
*C-CONFIRMED BY GCMS
1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

01/04/91

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PESTICIDES/PCB'S DATA REPORT
PROG ELEM: NSF COLLECTED BY: M GORDON
    PROJECT NO. 91-025
**
                     SAMPLE NO. 51645 SAMPLE TYPE:
                                                                                                                   ...
                                                              CITY: PALMETTO
                                                                                       ST: FL
* *
    SOURCE:
                                                                                                                   * *
                                                              COLLECTION START: 10/17/90 1630 STOP: 00/00/00
    STATION ID: SD-04
* *
                                                                                                                   * *
**
    CASE NUMBER: 15099
                             SAS NUMBER:
                                                               D. NUMBER: Y166
                                                                                                                   **
**
                                                                                                                   **
UG/KG
                     ANALYTICAL RESULTS
                                                              UG/KG
                                                                                ANALYTICAL RESULTS
    20U ALPHA-BHC
                                                              200U
                                                                   METHOXYCHLOR
    20Ŭ
        BETA-BHC
                                                               40U
                                                                   ENDRIN KETONE
    20Ŭ
                                                                   CHLORDANE (TECH. MIXTURE) /1
GAMMA-CHLORDANE /2
        DELTA-BHC
        GAMMA-BHC (LINDANE)
    200
                                                              200U
    200
        HEPTACHLOR
                                                              200Ú
                                                                   ALPHA-CHLORDANE
    20Ŭ
                                                                   TOXAPHENE
        ALDRIN
                                                              400U
                                                                   PCB-1016 (AROCLOR 1016)
PCB-1221 (AROCLOR 1221)
PCB-1232 (AROCLOR 1232)
PCB-1242 (AROCLOR 1242)
PCB-1248 (AROCLOR 1248)
        HEPTACHLOR EPOXIDE
    20U
                                                              200U
        ENDOSULFAN I (ALPHA)
    20U
                                                              2000
    40U
        DIELDRIN
                                                              200Ú
        4,4'-DDE (P,P'-DDE)
ENDRIN
                                                              200Ŭ
    40U
    40U
                                                              200Ü
        ENDOSULFAN II (BETA)
4.4'-DDD (P,P'-DDD)
    40Ŭ
                                                                   PCB-1254 (AROCLOR 1254)
                                                              400U
                                                                   PCB-1260 (AROCLOR 1260)
    40U
                                                              400U
    40U ENDOSULFAN SULFATE
                                                                19
                                                                   PERCENT MOISTURE
    40U 4,4'-DDT (P,P'-DDT)
```

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REALYZED IS NECESSARY FOR VERIFICATION.

^{1.} WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS. *C-CONFIRMED BY GCMS

01/04/91

PESTICIDES/PCB'S DATA REPORT		
	TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON ST: FL COLLECTION START: 10/17/90 1620 STOP: D. NUMBER: Y167	*** **
	* * * * * * * * * * * * * * * * * * *	· •
O.OSOU ALPHA-BHC O.OSOU BETA-BHC O.OSOU DELTA-BHC O.OSOU GAMMA-BHC (LINDANE) O.OSOU HEPTACHLOR O.OSOU ALDRIN O.OSOU HEPTACHLOR EPOXIDE O.OSOU HEPTACHLOR EPOXIDE O.OSOU ENDOSULFAN I (ALPHA) O.1OU DIELDRIN O.1OU 4,4'-DDE (P,P'-DDE) O.1OU ENDRIN O.1OU 4,4'-DDE (P,P'-DDD) O.1OU ENDOSULFAN II (BETA) O.1OU 4,4'-DDD (P,P'-DDD) O.2OU ENDOSULFAN SULFATE O.1OU 4,4'-DDT (P,P'-DDT)	0.50U METHOXYCHLOR 0.10U ENDRIN KETONE CHLORDANE (TECH. MIXTURE) /1 0.50U GAMMA-CHLORDANE /2 0.50U ALPHA-CHLORDANE /2 1.0U TOXAPHENE 0.50U PCB-1016 (AROCLOR 1016) 0.50U PCB-1221 (AROCLOR 1221) 0.50U PCB-1232 (AROCLOR 1232) 0.50U PCB-1242 (AROCLOR 1242) 0.50U PCB-1248 (AROCLOR 1244) 1.0U PCB-1254 (AROCLOR 1254) 1.0U PCB-1260 (AROCLOR 1260)	

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN

*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

*C-CONFIRMED BY GCMS

1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM

EPA-REGION IV ESD. ATHENS. GA. 01/04/91

PESTICIDES/PCB'S DATA I *** * * * * * * * * ** PROJECT NO. 91-02! ** SOURCE: AMAX PHOSI ** STATION ID: SW-08 ** CASE NUMBER: 1509! **	* * * * * * * * * * * * * * * * * * *	# * * * * * * * * * * * * * * * * * * *
UG/L	ANALYTICAL RESULTS	UG/L ANALYTICAL RESULTS
0.050U ALPHA-BHC 0.050U BETA-BHC 0.050U DELTA-BHC 0.050U GAMMA-BHC (L. 0.050U HEPTACHLOR 0.050U ALDRIN 0.050U HEPTACHLOR EF 0.050U ENDOSULFAN I 0.10U DIELDRIN 0.10U 4,4'-DDE (P,F 0.10U ENDOSULFAN I 0.10U 4,4'-DDC (P,F 0.10U 4,4'-DDC (P,F 0.20U ENDOSULFAN I 0.10U 4,4'-DDT (P,F 0.20U ENDOSULFAN I 0.10U 4,4'-DDT (P,F	POXIDE (ALPHA) P'-DDE) I (BETA) P'-DDD) ULFATE	0.50U METHOXYCHLOR 0.10U ENDRIN KETONE CHLORDANE (TECH. MIXTURE) /1 0.50U GAMMA-CHLORDANE /2 0.50U ALPHA-CHLORDANE /2 1.0U TOXAPHENE 0.50U PCB-1016 (AROCLOR 1016) 0.50U PCB-1221 (AROCLOR 1221) 0.50U PCB-1232 (AROCLOR 1232) 0.50U PCB-1242 (AROCLOR 1242) 0.50U PCB-1248 (AROCLOR 1248) 1.0U PCB-1254 (AROCLOR 1254) 1.0U PCB-1260 (AROCLOR 1260)

REMARKS

REMARKS

FOOTNOTES *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
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*C-CONFIRMED BY GCMS 1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

01/04/91 PESTICIDES/PCR'S DATA REPORT

*** * * * * * * * * * * * * * * * * *	AMAX PHOSPHATE FAC ID: SD-08 MBER: 15099	LE NO. 51648 SAI IL SAS NUMBER:	MPLE TYPE: SOIL	* * * * * * * * * * * * * * * * * * *	k
*** * * * * * * * * * * * * * * * * *	ANALYTI PHA-BHC	* * * * * * * * * * * * * * * * * * *	* * * * * * *	 UG/KG ANALYTICAL RESULTS 240U METHOXYCHLOR 47U ENDRIN KETONE CHLORDANE (TECH. MIXTURE) /1 240U GAMMA-CHLORDANE /2 240U ALPHA-CHLORDANE /2 470U TOXAPHENE 240U PCB-1016 (AROCLOR 1016) 240U PCB-1221 (AROCLOR 1221) 240U PCB-1232 (AROCLOR 1232) 240U PCB-1232 (AROCLOR 1242) 350 PCB-1248 (AROCLOR 1242) 350 PCB-1248 (AROCLOR 1248) 470U PCB-1254 (AROCLOR 1254) 470U PCB-1260 (AROCLOR 1260) 32 PERCENT MOISTURE	

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
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*C-CONFIRMED BY GCMS 1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

01/04/91

PESTICIDES/PCB'S DATA REPORT	ETA REGION IV ESD, ATTENS, GA.	01,04,51
	PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1505 STOP: D. NUMBER: Y159	*** **
UG/KG ANALYTICAL RESULTS	* * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * * *
33U ALPHA-BHC 33U BETA-BHC 33U DELTA-BHC 33U GAMMA-BHC (LINDANE) 40U HEPTACHLOR 33U ALDRIN 33U HEPTACHLOR EPOXIDE 33U ENDOSULFAN I (ALPHA) 67U DIELDRIN 67U 4.4'-DDE (P.P'-DDE) 67U ENDOSULFAN II (BETA) 67U 4.4'-DDD (P.P'-DDD) 67U ENDOSULFAN SULFATE 67U 4.4'-DDT (P.P'-DDT)	330U METHOXYCHLOR 67U ENDRIN KETONE CHLORDANE (TECH. MIXTURE) /1 330U GAMMA-CHLORDANE /2 330U ALPHA-CHLORDANE /2 670U TOXAPHENE 330U PCB-1016 (AROCLOR 1016) 330U PCB-1221 (AROCLOR 1221) 330U PCB-1222 (AROCLOR 1232) 330U PCB-1242 (AROCLOR 1242) 330U PCB-1242 (AROCLOR 1242) 330U PCB-1254 (AROCLOR 1248) 670U PCB-1254 (AROCLOR 1254) 670U PCB-1260 (AROCLOR 1260) 52 PERCENT MOISTURE	

REMARKS

REMARKS

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*C-CONFIRMED BY GCMS 1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

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PESTICIDES/PCB'S DATA REPORT
PROJECT NO. 91-025 SAMPLE NO. 51650 SAMPLE TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON ST. FL CITY: PALMETTO ST: FL STATION ID: SW-11 COLLECTION START: 10/17/90 1445 STOP: 00/00/00
**
* *
                                                                                                                         **
* *
                                                                                                                         **
    CASE NUMBER: 15099
                               SAS NUMBER:
                                                                  D. NUMBER: Y158
                                                                                                                         **
* *
                                                                                                                         **
ANALYTICAL RESULTS
   UG/L
                                                                  UG/L
                                                                                    ANALYTICAL RESULTS
 O.OSOU ALPHA-BHC
                                                                 O.50U METHOXYCHLOR
 0.050U
0.050U
         BETA-BHC
                                                                 0.100
                                                                       ENDRIN KETONE
                                                                       CHLORDANE (TECH. MIXTURE) /1
GAMMA-CHLORDANE /2
         DELTA-BHC
  0.050Ŭ
         GAMMA-BHC (LINDANE)
                                                                 0.500
  0.0500
         HEPTACHLOR
                                                                       ALPHA-CHLORDANE
                                                                 0.500
  0.0500
         ALDRIN
                                                                 1.00
                                                                       TOXAPHENE
  0.050U
         HEPTACHLOR EPOXIDE
                                                                 0.500
                                                                       PCB-1016 (AROCLOR 1016)
                                                                       PCB-1221 (AROCLOR 1221)
  0.050U
         ENDOSULFAN I (ALPHA)
                                                                 0.500
  0.100
         DIELDRIN
                                                                 0.500
                                                                       PCB-1232 (AROCLOR 1232)
                                                                       PCB-1242 (AROCLOR 1242)
PCB-1248 (AROCLOR 1248)
PCB-1254 (AROCLOR 1254)
PCB-1250 (AROCLOR 1250)
         4,4'-DDE (P,P'-DDE)
ENDRIN
  O. 100
                                                                 0.500
  0.100
                                                                 0.500
         ENDOSULFAN II (BETA)
  0.100
                                                                  1.00
         4,4'-DDD (P,P'-DDD)
  0.100
                                                                  1.00
  0.600
         ENDOSULFAN SULFATE
```

REMARKS

0.100

4.4'-DDT (P.P'-DDT)

REMARKS

FOOTNOTES *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

^{*}C-CONFIRMED BY GCMS 1. WHEN NO VALUE IS REPORTED. SEE CHLORDANE CONSTITUENTS.

**"

01/04/91 PESTICIDES/PCB'S DATA REPORT

*** PROJECT NO. 91-025 SAMPLE NO. 51651 SAMPLE TYPE: SURFACEWA

** PROJECT NO. 91-025 SAMPLE NO. 51651 SAMPLE TYPE: SURFACEWA

** SOURCE: AMAX PHOSPHATE FACIL

** STATION ID: SW-09

** CASE NUMBER: 15099 SAS NUMBER:

** D. NUMBER: Y163

** * *

ANALYTICAL RESULTS UG/L UG/L ANALYTICAL RESULTS

O.OSOU ALPHA-BHC 0.50U METHOXYCHLOR 0.0500 BETA-BHC O.10U ENDRIN KETONE 0.0500 DELTA-BHC CHLORDANE (TECH. MIXTURE) /1 GAMMA-CHLORDANE /2 GAMMA-BHC (LINDANE) 0.500 0.0500 /2 /2 0.0500 **HEPTACHLOR** 0.500 ALPHA-CHLORDANE 0.0500 ALDRIN TOXAPHENE 1.00 HEPTACHLOR EPOXIDE 0.0500 0.500 PCB-1016 (AROCLOR 1016) ENDOSULFAN I (ALPHA) 0.0500 0.500 PCB-1221 (AROCLOR 1221) PCB-1232 (AROCLOR 1232) 0.100 DIELDRIN 0.500 PCB-1242 (AROCLOR 1242) 0.100 4,4'-DDE (P,P'-DDE) 0.500 0.100 ENDRIN 0.500 PCB-1248 (AROCLOR 1248)

ENDOSULFAN II (BETA) PCB-1254 (AROCLOR 1254) PCB-1260 (AROCLOR 1260) 0.100 1.00 4,4'-DDD (P,P'-DDD) 0.100 1.00 ENDOSULFAN SULFATE 0.100 0.100 4.4'-DDT (P.P'-DDT)

REMARKS ***REMARKS***

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*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN

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*C-CONFIRMED BY GCMS

1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM

EPA-REGION IV ESD, ATHENS, GA. 01/04/91

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PESTICIDES/PCB'S DATA REPORT
PROG ELEM: NSF COLLECTED BY: M GORDON
    PROJECT NO. 91-025 SAMPLE NO. 51652 SAMPLE TYPE: SOIL
**
                                                                                                                     ** /
    SOURCE: AMAX PHOSPHATE FACIL
                                                               CITY: PALMETTO ST: "FL COLLECTION START: 10/17/90 1530 STOP: 00/00/00
* *
                                                                                                                     **
**
    STATION ID: SD-09
                                                                                                                     **
**
    CASE NUMBER: 15099
                              SAS NUMBER:
                                                                D. NUMBER: Y162
                                                                                                                     **
* *
                                                                                                                     **
UG/KG
                     ANALYTICAL RESULTS
                                                               UG/KG
                                                                                 ANALYTICAL RESULTS
    27U ALPHA-BHC
                                                               270U METHOXYCHLOR
    27U BETA-BHC
                                                                530
                                                                     ENDRIN KETONE
    27U DELTA-BHC
                                                                     CHLORDANE (TECH. MIXTURE) /1
GAMMA-CHLORDANE /2
        GAMMA-BHC (LINDANE)
    270
                                                               2700
    50U HEPTACHLOR
                                                               270Ú
                                                                     ALPHA-CHLORDANE
    27Ú
                                                                     TOXAPHENE
        ALDRIN
                                                               530U
    27Ŭ
        HEPTACHLOR EPOXIDE
                                                               270U
                                                                     PCB-1016 (AROCLOR 1016)
                                                                    PCB-1016 (AROCLOR 1016)
PCB-1221 (AROCLOR 1221)
PCB-1232 (AROCLOR 1232)
PCB-1242 (AROCLOR 1242)
PCB-1248 (AROCLOR 1248)
PCB-1254 (AROCLOR 1254)
        ENDOSULFAN I (ALPHA)
    27U
                                                               270Û
    53U DIELDRIN
                                                                270Ŭ
        4.4'-DDE (P.P'-DDE)
    530
                                                               270U
        ENDRIN
                                                                270Ŭ
    530
    53Ŭ
        ENDOSULFAN II (BETA)
                                                               530Ŭ
    53Ŭ
        4.4' DDD (P.P'-DDD)
                                                                     PCB-1260 (AROCLOR 1260)
                                                               5300
    53U ENDOSULFAN SULFATE
                                                                     PERCENT MOISTURE
    53U 4.4'-DDT (P.P'-DDT)
```

REMARKS

REMARKS

FOOTNOTES

*A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN

*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

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*C-CONFIRMED BY GCMS

1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

01/04/91 PESTICIDES/PCB'S DATA REPORT PROG ELEM: NSF COLLECTED BY: M GORDON PROJECT NO. 91-025 SAMPLE NO. 51653 SAMPLE TYPE: SOIL ** ***

CITY: PALMETTO ST: FL
COLLECTION START: 10/17/90 1520 STOP: 00/00/00 SOURCE: AMAX PHOSPHATE FACIL * * * * ** STATION ID: SD-07 * * ** CASE NUMBER: 15099 SAS NUMBER: D. NUMBER: Y160 **

**

UG/KG ANALYTICAL RESULTS UG/KG ANALYTICAL RESULTS 21U ALPHA-BHC 21U BETA-BHC 210U METHOXYCHLOR 43U **ENDRIN KETONE** 210 DELTA-BHC CHLORDANE (TECH. MIXTURE) /1 GAMMA-CHLORDANE 21U GAMMA-BHC (LINDANE) 2100 /2 40U HEPTACHLOR 2100 ALPHA-CHLORDANE

TOXAPHENE 21U ALDRIN 430U 210 HEPTACHLOR EPOXIDE PCB-1016 (AROCLOR 1016) 2100 PCB-1221 (AROCLOR 1221) 21U ENDOSULFAN I (ALPHA) 210U 43U DIELDRIN 2100 PCB-1232 (AROCLOR 1232) 210U PCB-1242 (AROCLOR 1242) 210U PCB-1248 (AROCLOR 1248) 430U PCB-1254 (AROCLOR 1254) 430U PCB-1260 (AROCLOR 1260) 43U 4,4'-DDE (P.P'-DDE) ENDRIN 43Ü ENDOSULFAN II (BETA) 43U

4.4'-DDD (P.P'-DDD) 43Ú 43U ENDOSULFAN SULFATE PERCENT MOISTURE

REMARKS ***REMARKS***

FOOTNOTES

43U 4.4'-DDT (P.P'-DDT)

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
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*C-CONFIRMED BY GCMS
1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

01/04/91

```
PESTICIDES/PCB'S DATA REPORT
PROJECT NO. 91-025 SAMPLE NO. 51654 SAMPLE TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON STIFL FL STATION ID: SW-07 COLLECTION START: 10/17/90 1515 STOP: 00/00/00
**
**
                                                                                                                           **
* *
                                                                                                                           * *
    CASE NUMBER: 15099
                               SAS NUMBER:
                                                                    D. NUMBER: Y161
**
                                                                                                                           **
                                                                                                                           * *
UG/L
                      ANALYTICAL RESULTS
                                                                   UG/L
                                                                                      ANALYTICAL RESULTS
                                                                  0.50U METHOXYCHLOR
 O.OSOU ALPHA-BHC
 0.050U
         BETA-BHC
                                                                  0.100
                                                                        ENDRIN KETONE
 0.0500
         DELTA-BHC
                                                                         CHLORDANE (TECH. MIXTURE) /1
 0.0500
         GAMMA-BHC (LINDANE)
                                                                        GAMMA-CHLORDANE
                                                                  0.500
 0.0500
         HEPTACHLOR
                                                                  0.500
                                                                         ALPHA-CHLORDANE
  0.0500
         ALDRIN
                                                                  1.00
                                                                        TOXAPHENE
         HEPTACHLOR EPOXIDE
  0.0500
                                                                  0.500
                                                                         PCB-1016 (AROCLOR 1016)
                                                                        PCB-1016 (AROCLOR 1016)
PCB-1221 (AROCLOR 1221)
PCB-1232 (AROCLOR 1232)
PCB-1242 (AROCLOR 1242)
PCB-1248 (AROCLOR 1248)
PCB-1254 (AROCLOR 1254)
PCB-1260 (AROCLOR 1260)
         ENDOSULFAN I (ALPHA)
  0.0500
                                                                  0.500
  0.100
         DIELDRIN
                                                                  0.500
         4,4'-DDE (P,P'-DDE)
ENDRIN
  0.100
                                                                  0.500
  0.100
                                                                  0.500
  0.100
         ENDOSULFAN II (BETA)
                                                                   1.00
  0.100
         4,4'-DDD (P,P'-DDD)
                                                                   1.00
  0.100
         ENDOSULFAN SULFATE
         4.4'-DDT (P.P'-DDT)
  0.100
```

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

^{1.} WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS. *C-CONFIRMED BY GCMS

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM

EPA-REGION IV ESD, ATHENS, GA. 01/04/91 PESTICIDES/PCB'S DATA REPORT

```
PROG ELEM: NSF COLLECTED BY: M GORDON ST: FI
    PROJECT NO. 91-025 SAMPLE NO. 51655 SAMPLE TYPE: SOIL
                                                                                                                    ***
    SOURCE: AMAX PHOSPHATE FACIL
**
                                                                                                                     **
    STATION ID: SD-06
                                                               COLLECTION START: 10/17/90 1445 STOP: 00/00/00
**
                                                                                                                     **
    CASE NUMBER: 15099
                             SAS NUMBER:
**
                                                                D. NUMBER: Y156
                                                                                                                    **
**
                                                                                                                    **
   UG/KG
                     ANALYTICAL RESULTS
                                                               UG/KG
                                                                                 ANALYTICAL RESULTS
                                                               200U METHOXYCHLOR
    20U ALPHA-BHC
    200
        BETA-BHC
                                                                39U
                                                                    ENDRIN KETONE
    200
200
                                                                    CHLORDANE (TECH. MIXTURE) /1
GAMMA-CHLORDANE /2
        DELTA-BHC
        GAMMA-BHC (LINDANE)
                                                               2000
                                                                                    /2
/2
    20Ŭ
        HEPTACHLOR
                                                                    ALPHA-CHLORDANE
                                                               200U
    20U
        ALDRIN
                                                               390U
                                                                    TOXAPHENE
    20U
20U
                                                                    PCB-1016 (AROCLOR 1016)
PCB-1221 (AROCLOR 1221)
        HEPTACHLOR EPOXIDE
                                                               200Ŭ
                                                               200Ŭ
        ENDOSULFAN I (ALPHA)
                                                               200U
200U
200U
200U
                                                                    PCB-1232 (AROCLOR 1232)
        DIELDRIN
                                                                    PCB-1242 (AROCLOR 1242)
PCB-1248 (AROCLOR 1248)
PCB-1254 (AROCLOR 1254)
PCB-1260 (AROCLOR 1260)
        4.4'-DDE (P.P'-DDE)
ENDRIN
    390
    390
    390
        ENDOSULFAN II (BETA)
                                                               3900
        4,4'-DDD (P.P'-DDD)
    390
                                                               3900
         ENDOSULFAN SULFATE
                                                                    PERCENT MOISTURE
    390
         4.4'-DDT (P.P'-DDT)
```

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *NA-NOT ANALYZED

^{*}K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *L-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

*C-CONFIRMED BY GCMS

1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

SYSTEM GA.
VAGEMENT ATHENS
E AND ANALYSIS MAN SA-REGION IV ESD,
MPLE AND EPA-REC
SA

01/04/91	00/00/00	*** * * * * * * *	
SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD, ATHENS, GA.	* * * * * * * * * * * * * * * * * * *	: * * * * * * * * * * * * * * * * * * *	0.50U METHOXYCHLOR 0.10U ENDRIN KETONE CHLORDANE (TECH. MIXTURE) /1 0.50U GAMMA-CHLORDANE /2 1.0U TOXAPHENE /2 0.50U PCB-1016 (AROCLOR 1221) 0.50U PCB-1222 (AROCLOR 1222) 0.50U PCB-1242 (AROCLOR 1232) 0.50U PCB-1248 (AROCLOR 1248) 1.0U PCB-1254 (AROCLOR 1254) 1.0U PCB-1256 (AROCLOR 1254)
	PESTICIDES/PCB'S DATA REPORT ** * * * * * * * * * * * * * * * * *	*** * * * * * * * * * * * * * * * * *	0.050U ALPHA-BHC 0.050U BETA-BHC 0.050U DELTA-BHC 0.050U HEPTACHLOR 0.050U HEPTACHLOR 0.050U HEPTACHLOR 0.050U HEPTACHLOR 0.050U HEPTACHLOR 0.050U HEPTACHLOR 0.050U HEPTACHLOR 0.10U UA'A'-DDE (P.P'-DDE) 0.10U ENDOSULFAN II (BETA) 0.10U ENDOSULFAN II (BETA) 0.10U ENDOSULFAN II (BETA) 0.10U ENDOSULFAN SUL-DDD) 0.10U A'-DDD (P.P'-DDD) 0.10U ENDOSULFAN SUL-DDD)

REMARKS

FOOTNOTES

*A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

*A-AVERAGE VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN

*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL ON BE GREATER THAN VALUE GIVEN

*N-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE SAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

*C-CONFIRMED BY GCMS

REMARKS

01/04/91

```
PESTICIDES/PCB'S DATA REPORT
** PROJECT NO. 91-025 SAMPLE NO. 51661 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON **

** SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO ST: FL **
                                                                                                                                         **
     STATION ID: SB-04
                                                                           COLLECTION START: 10/18/90 1030 STOP: 00/00/00
* *
                                                                                                                                         **
     CASE NUMBER: 15099
                                   SAS NUMBER:
                                                                           D. NUMBER: Y174
**
                                                                                                                                         **
                                                                                                                                         **
    UG/KG
                         ANALYTICAL RESULTS
                                                                           UG/KG
                                                                                                ANALYTICAL RESULTS
     20U ALPHA-BHC
                                                                           200U METHOXYCHLOR
          BETA-BHC
     20U
20U
                                                                                 ENDRIN KETONE
                                                                           390
                                                                                 CHLORDANE (TECH. MIXTURE) /1
          DELTA-BHC
                                                                                 GAMMA-CHLORDANE
     20U
          GAMMA-BHC (LINDANE)
                                                                           2000
                                                                                 ALPHA-CHLORDANE
     30U
          HEPTACHLOR
                                                                           2000
          ALDRIN
                                                                                 TOXAPHENE
                                                                           3900
                                                                                PCB-1016 (AROCLOR 1016)
PCB-1221 (AROCLOR 1221)
PCB-1232 (AROCLOR 1232)
          HEPTACHLOR EPOXIDE
     200
                                                                           200U
     20U
          ENDOSULFAN I (ALPHA)
                                                                           2000
          DIELDRIN
                                                                           2000
                                                                                PCB-1242 (AROCLOR 1242)
PCB-1248 (AROCLOR 1248)
PCB-1254 (AROCLOR 1254)
PCB-1260 (AROCLOR 1260)
          4,4'-DDE (P,P'-DDE)
ENDRIN
     39U
                                                                           200Ú
     39U
                                                                           2000
          ENDOSULFAN II (BETA)
4,4'-DDD (P,P'-DDD)
     39Ú
                                                                           390U
     390
                                                                           390Ú
     390
          ENDOSULFAN SULFATE
                                                                                PERCENT MOISTURE
                                                                            18
          4.4'-DDT (P.P'-DDT)
```

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION. *C-CONFIRMED BY GCMS 1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

01/04/91

PESTICIDES/PCB'S DATA REPORT	Z. W. RECTOR IV ESS, AMERIS, GA	01,01,01
**	TYPE: GROUNDWA PROG ELEM: NSF COLLECTED BY: M GORDON ST: FL COLLECTION START: 10/18/90 1040 STOP: D. NUMBER: Y175	** <i>*</i>
*** * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * *
O.10U ALPHA-BHC O.10U BETA-BHC O.10U DELTA-BHC O.10U GAMMA-BHC (LINDANE) O.10U HEPTACHLOR O.10U ALDRIN O.10U HEPTACHLOR EPOXIDE O.10U ENDOSULFAN I (ALPHA) O.20U DIELDRIN O.20U 4,4'-DDE (P,P'-DDE) O.20U ENDRIN O.20U ENDOSULFAN II (BETA) O.20U 4,4'-DDD (P,P'-DDD) O.20U 4,4'-DDD (P,P'-DDD) O.20U 4,4'-DDT (P,P'-DDD) O.20U 4,4'-DDT (P,P'-DDD)	1.0U METHOXYCHLOR 0.20U ENDRIN KETONE CHLORDANE (TECH. MIXTURE) /1 1.0U GAMMA-CHLORDANE /2 1.0U ALPHA-CHLORDANE /2 2.0U TOXAPHENE 1.0U PCB-1016 (AROCLOR 1016) 1.0U PCB-1221 (AROCLOR 1221) 1.0U PCB-1232 (AROCLOR 1232) 1.0U PCB-1242 (AROCLOR 1242) 1.0U PCB-1248 (AROCLOR 1248) 2.0U PCB-1254 (AROCLOR 1254) 2.0U PCB-1260 (AROCLOR 1260)	

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.
*C-CONFIRMED BY GCMS
1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

01/04/91

PESTICIDES/PCB'S DATA R	REPORT	ETA REGION IV ESD,	ATTIENS, QA.	01/04/91
	* * * * * * * * * * * * * * * * * * *	TYPE: SOIL (* * * * * * * * * * * * * * * * * * *	***
*** * * * * * * * * * * * * * * * * *	ANALYTICAL RESULTS		* * * * * * * * * * * * * * * * * * *	* * * * * * * * ***
21U ALPHA-BHC 21U BETA-BHC 21U DELTA-BHC 21U GAMMA-BHC (LI 21U HEPTACHLOR 21U HEPTACHLOR EP 21U HEPTACHLOR EP 21U ENDOSULFAN I 42U DIELDRIN 42U DIELDRIN 42U ENDOSULFAN II 42U ENDOSULFAN II 42U ENDOSULFAN II 42U ENDOSULFAN II 42U 4,4'-DDD (P,F) 42U ENDOSULFAN SU 42U 4,4'-DDT (P,F)	POXIDE (ALPHA) POY-DDE) (BETA) POY-DDD) PUFATE	<u></u>	210U METHOXYCHLOR 42U ENDRIN KETONE CHLORDANE (TECH. MIXTURE) /1 210U GAMMA-CHLORDANE /2 210U ALPHA-CHLORDANE /2 420U TOXAPHENE 210U PCB-1016 (AROCLOR 1016) 210U PCB-1221 (AROCLOR 1221) 210U PCB-1232 (AROCLOR 1232) 210U PCB-1242 (AROCLOR 1242) 210U PCB-1248 (AROCLOR 1248) 420U PCB-1254 (AROCLOR 1254) 420U PCB-1250 (AROCLOR 1260) 24 PERCENT MOISTURE	

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.
*C-CONFIRMED BY GCMS
1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

01/04/91

PESTICIDES/PCB'S DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51664 SAMPLE TYPE: GROUNDWA PROG ELEM: NSF COLLECTED BY: M GORDON * * ** * SOURCE: AMAX PHOSPHATE FACIL ST: FL * * CITY: PALMETTO * *

CITY: PALMETTO ST: FL COLLECTION START: 10/18/90 0930 STOP: 00/00/00 ** STATION ID: TW-05 ** * * CASE NUMBER: 15099 SAS NUMBER: D. NUMBER: Y172 ** * * **

UG/L ANALYTICAL RESULTS UG/L ANALYTICAL RESULTS 0.50U METHOXYCHLOR O.050U ALPHA-BHC BETA-BHC 0.0500 0.100 ENDRIN KETONE 0.0500 DELTA-BHC CHLORDANE (TECH. MIXTURE) /1 0.0500 GAMMA-BHC (LINDANE) GAMMA-CHLORDANE 0.500

HEPTACHLOR 0.0500 0.500 ALPHA-CHLORDANE 0.0500 ALDRIN TOXAPHENE 1.00 0.0500 HEPTACHLOR EPOXIDE PCB-1016 (AROCLOR 1016) 0.500 ENDOSULFAN I (ALPHA) PCB-1221 (AROCLOR 1221) 0.0500 0.500 0.100 DIELDRIN 0.500 PCB-1232 (AROCLOR 1232)

4,4'-DDE (P,P'-DDE) ENDRIN PCB-1242 (AROCLOR 1242) PCB-1248 (AROCLOR 1248) PCB-1254 (AROCLOR 1254) 0.500 0.100 0.100 ENDOSULFAN II (BETA) 4,4'-DDD (P,P'-DDD) 1.00 O. 100 0.100 1.0Ŭ PCB-1260 (AROCLOR 1260) 0.300 ENDOSULFAN SULFATE

REMARKS ***REMARKS***

0.100

4.4'-DDT (P.P'-DDT)

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT. *R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REAVALYSIS IS NECESSARY FOR VERIFICATION. *C-CONFIRMED BY GCMS 1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

01/04/91 PESTICIDES/PCB'S DATA REPORT PROG ELEM: NSF COLLECTED BY: M GORDON PROJECT NO. 91-025 SAMPLE NO. 51665 SAMPLE TYPE: SOIL ** SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO ST: FL COLLECTION START: 10/18/90 0910 STOP: 00/00/00 CITY: PALMETTO ŚŤ: FĽ * * * * STATION ID: SB-05 * * CASE NUMBER: 15099 SAS NUMBER: ** D. NUMBER: Y171 ** * * ** UG/KG ANALYTICAL RESULTS UG/KG ANALYTICAL RESULTS

1900 METHOXYCHLOR 19U ALPHA-BHC BETA-BHC 190 380 ENDRIN KETONE DELTA-BHC CHLORDANE (TECH. MIXTURE) /1 190 GAMMA-CHLORDANE GAMMA-BHC (LINDANE) 190 1900 HEPTACHLOR 190 1900 ALPHA-CHLORDANE ALDRIN 190 380Ŭ TOXAPHENE 190U PCB-1221 (AROCLOR 1016)
190U PCB-1221 (AROCLOR 1221)
190U PCB-1232 (AROCLOR 1232)
190U PCB-1242 (AROCLOR 1242)
190U PCB-1248 (AROCLOR 1248)
380U PCB-1254 (AROCLOR 1254)
380U PCB-1260 (AROCLOR 1260) HEPTACHLOR EPOXIDE 190 ENDOSULFAN I (ALPHA) 190 38U DIELDRIN 4.4'-DDE (P.P'-DDE) 380 380 ENDRIN 380 ENDOSULFAN II (BETA) 4.4'-DDD (P.P'-DDD) 38U ENDOSULFAN SULFATE 16 PERCENT MOISTURE 4.4'-DDT (P.P'-DDT)

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

^{*}K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC_INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION. 1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS. *C-CONFIRMED BY GCMS

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PESTICIDES/PCB'S DATA REPORT
PROG ELEM: NSF COLLECTED BY: M GORDON ST: FL
    PROJECT NO. 91-025 SAMPLE NO. 51666 SAMPLE TYPE: SOIL SOURCE: AMAX PHOSPHATE FACIL
**
                                                                                                                        **
                                                                                                                         * *
                                                                 COLLECTION START: 10/18/90 0900 STOP: 00/00/00
    STATION ID: SS-05
**
                                                                                                                         * *
                              SAS NUMBER:
                                                                  D. NUMBER: Y170
    CASE NUMBER: 15099
* *
                                                                                                                        **
* *
                                                                                                                        * *
   UG/KG
                      ANALYTICAL RESULTS
                                                                 UG/KG
                                                                                    ANALYTICAL RESULTS
    19U ALPHA-BHC
                                                                 1900 METHOXYCHLOR
    19U BETA-BHC
                                                                  37U
                                                                      ENDRIN KETONE
                                                                      CHLORDANE (TECH. MIXTURE) /1
GAMMA-CHLORDANE /2
    190 DELTA-BHC
    19U GAMMA-BHC (LINDANE)
                                                                 190U
        HEPTACHLOR
                                                                 1900
                                                                       ALPHA-CHLORDANE
    20U
        ALDRIN
                                                                 370U
                                                                       TOXAPHENE
    190
    190
        HEPTACHLOR EPOXIDE
                                                                 1900
                                                                      PCB-1016 (AROCLOR 1016)
    19U ENDOSULFAN I (ALPHA)
                                                                 190U
                                                                      PCB-1221 (AROCLOR 1221)
    37U DIELDRIN
                                                                 1900
                                                                      PCB-1232 (AROCLOR 1232)
                                                                      PCB-1232 (AROCLOR 1232)
PCB-1242 (AROCLOR 1242)
PCB-1248 (AROCLOR 1248)
PCB-1254 (AROCLOR 1254)
PCB-1260 (AROCLOR 1260)
PERCENT MOISTURE
    37U 4.4'-DDE (P.P'-DDE)
                                                                 1900
    37Ū
        ENDRIN
                                                                 1900
    37U ENDOSULFAN II (BETA)
37U 4,4'-DDD (P,P'-DDD)
                                                                 370U
                                                                 370U
    370 ENDOSULFAN SULFATE
    37U 4,4'-DDT (P,P'-DDT)
```

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION. *C-CONFIRMED BY GCMS 1. WHEN NO VALUE IS REPORTED. SEE CHLORDANE CONSTITUENTS.

01/04/91

PESTICIDES/PCB'S DATA REPORT	The Medical IV 2007, Afficial, GA.	01/04/01
**	CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1150 STOP: 0 D. NUMBER: Y153	** *
UG/KG ANALYTICAL RESULTS	* * * * * * * * * * * * * * * * * * *	* * * * * * * * * ***
19U ALPHA-BHC 19U BETA-BHC 19U DELTA-BHC 19U GAMMA-BHC (LINDANE) 19U HEPTACHLOR 19U ALDRIN 19U HEPTACHLOR EPOXIDE 19U ENDOSULFAN I (ALPHA) 39U DIELDRIN 39U ENDRIN 39U ENDRIN 39U ENDOSULFAN II (BETA) 39U ENDOSULFAN II (BETA) 39U ENDOSULFAN SULFATE 39U 4,4'-DDT (P,P'-DDD) 39U ENDOSULFAN SULFATE	190U METHOXYCHLOR 39U ENDRIN KETONE CHLORDANE (TECH. MIXTURE) /1 190U GAMMA-CHLORDANE /2 190U ALPHA-CHLORDANE /2 390U TOXAPHENE 190U PCB-1016 (AROCLOR 1016) 190U PCB-1221 (AROCLOR 1221) 190U PCB-1232 (AROCLOR 1232) 190U PCB-1242 (AROCLOR 1232) 190U PCB-1242 (AROCLOR 1242) 190U PCB-1248 (AROCLOR 1242) 190U PCB-1254 (AROCLOR 1254) 390U PCB-1260 (AROCLOR 1260) 17 PERCENT MOISTURE	

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN

*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

*C-CONFIRMED BY GCMS

1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

EPA-REGION IV ESD. ATHENS. GA. 01/04/91 PESTICIDES/PCB'S DATA REPORT PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL PROJECT NO. 91-025 SAMPLE NO. 51668 SAMPLE TYPE: SOIL ** SOURCE: AMAX PHOSPHATE FACIL ** ** COLLECTION START: 10/17/90 1205 STOP: 00/00/00 ** STATION ID: SS-06 ** ** CASE NUMBER: 15099 SAS NUMBER: D. NUMBER: Y152 ** ** ** ANALYTICAL RESULTS UG/KG UG/KG ANALYTICAL RESULTS 20U ALPHA-BHC 200U **METHOXYCHLOR** ENDRÍN KETÖNE CHLORDANE (TECH. MIXTURE) /1 GAMMA-CHLORDANE /2 BETA-BHC 20U 40U 200 DELTA-BHC 200 GAMMA-BHC (LINDANE) 2000 200 HEPTACHLOR 2000 ALPHA-CHLORDANE 20U ALDRIN

40U 4,4'-DDE (P,P'-DDE) 40U ENDRIN ENDOSULFAN II (BETA) 40U 4,4'-DDD (P,P'-DDD) 40U 40U ENDOSULFAN SULFATE 40U 4.4'-DDT (P.P'-DDT)

HEPTACHLOR EPOXIDE

ENDOSULFAN I (ALPHA)

400U TOXAPHENE PCB-1016 (AROCLOR 1016) PCB-1221 (AROCLOR 1221) 200U 200Ŭ 2000 PCB-1232 (AROCLOR 1232) PCB-1242 (AROCLOR 1242) PCB-1248 (AROCLOR 1248) PCB-1254 (AROCLOR 1254) PCB-1260 (AROCLOR 1260) 200U 2000 400U 400U PERCENT MOISTURE

REMARKS

20U

20Ŭ

40U DIELDRIN

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.
*C-CONFIRMED BY GCMS
1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

FOOTNOTES

*A-AVERAGE VALUE

*K-ACTUAL VALUE IS

*C-QC INDICATES THE

*C-CONFIRMED BY GO *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NEGGOMS

1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

REMARKS

REMARKS

NECESSARY

FOR VERIFICATION

OF PRESENCE GIVEN

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MATERIAL

EPA-REGION IV ESD. ATHENS. GA. 01/04/91 PESTICIDES/PCB'S DATA REPORT PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL PROJECT NO. 91-025 SAMPLE NO. 51670 SAMPLE TYPE: ** * * SOURCE: CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1215 STOP: 00/00/00 * * ** STATION ID: SB-06 * * CASE NUMBER: 15099 SAS NUMBER: D. NUMBER: Y155 ** ** * * ** UG/KG ANALYTICAL RESULTS UG/KG ANALYTICAL RESULTS 190U METHOXYCHLOR 19U ALPHA-BHC BETA-BHC 190 38U ENDRIN KETONE CHLORDANE (TECH. MIXTURE) /1
GAMMA-CHLORDANE /2 DELTA-BHC 190 GAMMA-BHC (LINDANE) 190 1900 HEPTACHLOR ALPHA-CHLORDANE 190 1900 190 ALDRIN 3800 TOXAPHENE HEPTACHLOR EPOXIDE 190 PCB-1016 (AROCLOR 1016) 1900 PCB-1016 (ARUCLUR 1016) PCB-1221 (AROCLOR 1221) PCB-1232 (AROCLOR 1232) PCB-1242 (AROCLOR 1242) PCB-1248 (AROCLOR 1248) PCB-1254 (AROCLOR 1254) PCB-1260 (AROCLOR 1260) ENDOSULFAN I (ALPHA) 190 1900 DIELDRIN 1900 4,4'-DDE (P,P'-DDE) ENDRIN 38U 1900 380 1900

REMARKS

38U

ENDOSULFAN II (BETA)

4.4'-DDD (P.P'-DDD)

380 ENDOSULFAN SULFATE

38U 4.4'-DDT (P.P'-DDT)

REMARKS

380U

3800

PERCENT MOISTURE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

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*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION. 1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS. *C-CONFIRMED BY GCMS

EPA-REGION IV ESD, ATHENS, GA. 01/04/91 PESTICIDES/PCB'S DATA REPORT

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	20U ALPHA-BHC 20U BETA-BHC 20U DELTA-BHC 20U GAMMA-BHC (LINDANE) 20U HEPTACHLOR 20U HEPTACHLOR EPOXIDE 20U HEPTACHLOR EPOXIDE 20U ENDOSULFAN I (ALPHA) 40U DIELDRIN 40U 4,4'-DDE (P,P'-DDE) 10U ENDRIN 40U ENDOSULFAN II (BETA) 40U 4,4'-DDD (P,P'-DDD) 40U ENDOSULFAN SULFATE 40U 4,4'-DDT (P,P'-DDT)		200U METHOXYCHLOR 40U ENDRIN KETONE CHLORDANE (TECH. MIXTURE) /1 200U GAMMA-CHLORDANE /2 200U ALPHA-CHLORDANE /2 400U TOXAPHENE 200U PCB-1016 (AROCLOR 1016) 200U PCB-1221 (AROCLOR 1221) 200U PCB-1232 (AROCLOR 1232) 200U PCB-1242 (AROCLOR 1242) 200U PCB-1248 (AROCLOR 1248) 400U PCB-1254 (AROCLOR 1254) 400U PCB-1260 (AROCLOR 1260) 19 PERCENT MOISTURE	

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

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*C-CONFIRMED BY GCMS 1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

01/04/91 PESTICIDES/PCB'S DATA REPORT ** PROJECT NO. 91-025 SAMPLE NO. 51672 SAMPLE TYPE: GROUNDWA

** SOURCE: AMAX PHOSPHATE FACIL

** STATION ID: TW-03

** COLLECTION START: 10/17/90 1145 STOP: 00/00/00

**

CASE NUMBER: 15099 SAS NUMBER: D. NUMBER: Y151 * * ** ** * *

UG/L ANALYTICAL RESULTS UG/L ANALYTICAL RESULTS 0.50U METHOXYCHLOR O. OSOU ALPHA-BHC 0.0500 BETA-BHC O. 10U ENDRIN KETONE 0.050U 0.050U DELTA-BHC CHLORDANE (TECH. MIXTURE) /1 GAMMA-CHLORDANE GAMMA-BHC (LINDANE) 0.500 /2 /2 0.0500 HEPTACHLOR ALPHA-CHLORDANE 0.500 0.0500 ALDRIN TOXAPHENE 1.00 0.050U 0.050U HEPTACHLOR EPOXIDE 0.500 PCB-1016 (AROCLOR 1016) ENDOSULFAN I (ALPHA) 0.500 PCB-1221 (AROCLOR 1221) DIELDRIN PCB-1232 (AROCLOR 1232) 0.100 0.500 4,4'-DDE (P,P'-DDE) 0.100 0.500 PCB-1242 (AROCLOR 1242) PCB-1248 (AROCLOR 1248) PCB-1254 (AROCLOR 1254) 0.100 ENDRIN 0.500 O. 100 ENDOSULFAN II (BETA) 1.00 4,4'-DDD (P,P'-DDD) 0.100 PCB-1260 (AROCLOR 1260) 1.00 0.200 ENDOSULFAN SULFATE 4.4'-DDT (P.P'-DDT) 0.100

REMARKS

REMARKS

FOOTNOTES

*A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
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^{*}C-CONFIRMED BY GCMS 1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

EPA-REGION IV ESD. ATHENS. GA. 01/04/91

PESTICIDE	ES/PCB'S DATA REPORT	•
*** * * * ** PROJ		The state of the
*** * * * UG/L		* * * * * * * * * * * * * * * * * * *
0.050U 0.050U 0.050U 0.050U 0.050U 0.050U 0.10U 0.10U 0.10U 0.10U 0.10U	BETA-BHC DELTA-BHC DELTA-BHC GAMMA-BHC (LINDANE) HEPTACHLOR ALDRIN HEPTACHLOR EPOXIDE ENDOSULFAN I (ALPHA) DIELDRIN 4,4'-DDE (P,P'-DDE) ENDRIN ENDOSULFAN II (BETA) 4,4'-DDD (P,P'-DDD) ENDOSULFAN SULFATE	0.50U METHOXYCHLOR 0.10U ENDRIN KETONE CHLORDANE (TECH. MIXTURE) /1 0.50U GAMMA-CHLORDANE /2 1.0U TOXAPHENE 0.50U PCB-1016 (AROCLOR 1016) 0.50U PCB-1221 (AROCLOR 1221) 0.50U PCB-1232 (AROCLOR 1232) 0.50U PCB-1242 (AROCLOR 1242) 0.50U PCB-1248 (AROCLOR 1248) 1.0U PCB-1254 (AROCLOR 1254) 1.0U PCB-1260 (AROCLOR 1260)

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

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*C-CONFIRMED BY GCMS

1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

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PESTICIDES/PCB'S DATA REPORT
PROJECT NO. 91-025 SAMPLE NO. 51674 SAMPLE TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON ST: FL CITY: PALMETTO ST: FL COLLECTION START: 10/16/90 1330 STOP: 00/00/00
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    CASE NUMBER: 15099
                             SAS NUMBER:
                                                              D. NUMBER: Y137
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**
                                                                                                                 **
   ANALYTICAL RESULTS
   UG/L
                                                             UG/L
                                                                               ANALYTICAL RESULTS
                                                            0.500
 O. OSOU ALPHA-BHC
                                                                  METHOXYCHLOR
        BETA-BHC
 0.0500
                                                            0.100
                                                                  ENDRIN KETONE
                                                                   CHLORDANE (TECH. MIXTURE) /1
 0.0500
        DELTA-BHC
                                                                  GAMMA-CHLORDANE
 0.0500
        GAMMA-BHC (LINDANE)
                                                            0.500
 0.050U
0.050U
                                                                  ALPHA-CHLORDANE
        HEPTACHLOR
                                                            0.500
        ALDRIN
                                                                  TOXAPHENE
                                                             1.00
        HEPTACHLOR EPOXIDE
 0.0500
                                                            0.500
                                                                  PCB-1016 (AROCLOR 1016)
 0.050Ŭ
        ENDOSULFAN I (ALPHA)
                                                                  PCB-1221 (AROCLOR 1221)
                                                            0.500
                                                                  PCB-1232 (AROCLOR 1232)
  0.100
        DIELDRIN
                                                            0.500
  0.100
        4.4'-DDE (P.P'-DDE)
                                                            0.500
                                                                  PCB-1242 (AROCLOR 1242)
                                                                  PCB-1248 (AROCLOR 1248)
PCB-1254 (AROCLOR 1254)
PCB-1260 (AROCLOR 1260)
  Ŏ. 10U
        ENDRIN
                                                            0.500
  0.100
        ENDOSULFAN II (BETA)
                                                             1.00
        4,4'-DDD (P,P'-DDD)
  0.100
                                                             1.00
   0.24
        ENDOSULFAN SULFATE
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REMARKS

0.100

4.4'-DDT (P.P'-DDT)

REMARKS

FOOTNOTES *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
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01/04/91 PESTICIDES/PCB'S DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51675 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON .
SOURCE: AMAX PHOSPHATE FACIL STATION ID: SD-01 COLLECTION START: 10/16/90 1335 STOP: 00/00/00 * * * * * * ** * * ** CASE NUMBER: 15099 SAS NUMBER: D. NUMBER: Y136 ** ** ** UG/KG ANALYTICAL RESULTS UG/KG ANALYTICAL RESULTS 20U ALPHA-BHC 20U BETA-BHC 200U METHOXYCHLOR ENDRIN KETONE 41U DELTA-BHC CHLORDANE (TECH. MIXTURE) /1 20U GAMMA-BHC (LINDANE) GAMMA-CHLORDANE 2000 /2 /2 200 HEPTACHLOR 200U ALPHA-CHLORDANE TOXAPHENE ALDRIN 20U 410U PCB-1016 (AROCLOR 1016) PCB-1221 (AROCLOR 1221) HEPTACHLOR EPOXIDE 20U 200U ENDOSULFAN I (ALPHA) 2000 PCB-1231 (AROCLOR 1232) PCB-1232 (AROCLOR 1232) PCB-1242 (AROCLOR 1242) PCB-1248 (AROCLOR 1248) PCB-1254 (AROCLOR 1254) PCB-1260 (AROCLOR 1260) 41U DIELDRIN 2000 4.4'-DDE (P.P'-DDE) 41U 2000 ENDRIN 41U 200U 41U ENDOSULFAN II (BETA) 41U 4,4'-DDD (P,P'-DDD) 410U 410U 410 ENDOSULFAN SULFATE 21 PERCENT MOISTURE 41U 4.4'-DDT (P.P'-DDT)

REMARKS

REMARKS

FOOTNOTES

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*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN

^{*}K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

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*C-CONFIRMED BY GCMS

1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

EPA-REGION IV ESD, ATHENS, GA. 01/04/91 PESTICIDES/PCB'S DATA REPORT

DESTITITES/DEB. 2		
** PROJECT NO. ** SOURCE: AMAX ** STATION ID: ** CASE NUMBER:		CITY: PALMETTO ST: FL ** COLLECTION START: 10/16/90 1350 STOP: 00/00/00 ** D. NUMBER: Y329 **
**		* * * * * * * * * * * * * * * * * * *
0.050U HEPTACH 0.050U ALDRIN 0.050U HEPTACH 0.050U ENDOSUL 0.10U DIELDRI 0.10U 4,4'-DD 0.10U ENDRIN 0.10U ENDOSUL 0.10U 4,4'-DD	HC BHC BHC (LINDANE) HLOR EPOXIDE LFAN I (ALPHA) IN DE (P.P'-DDE) LFAN II (BETA) DD (P.P'-DDD) LFAN SULFATE	0.50U METHOXYCHLOR 0.10U ENDRIN KETONE CHLORDANE (TECH. MIXTURE) /1 0.50U GAMMA-CHLORDANE /2 0.50U ALPHA-CHLORDANE /2 1.0U TOXAPHENE 0.50U PCB-1016 (AROCLOR 1016) 0.50U PCB-1221 (AROCLOR 1221) 0.50U PCB-1232 (AROCLOR 1232) 0.50U PCB-1242 (AROCLOR 1242) 0.50U PCB-1248 (AROCLOR 1248) 1.0U PCB-1254 (AROCLOR 1254) 1.0U PCB-1260 (AROCLOR 1260)

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
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1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

01/04/91

** PROJECT NO. 91-025 SAMPLE NO. 51677 SAMPLE TYPE: SURFACEWA ** SOURCE: AMAX PHOSPHATE FACIL ** STATION ID: SW-02 ** CASE NUMBER: 15099 SAS NUMBER: **	CITY: PALMETTO ST: FL ** COLLECTION START: 10/16/90 1415 STOP: 00/00/00 ** D. NUMBER: Y141 **
*** * * * * * * * * * * * * * * * * *	UG/L ANALYTICAL RESULTS
0.050U ALPHA-BHC 0.050U BETA-BHC 0.050U DELTA-BHC 0.050U GAMMA-BHC (LINDANE) 0.050U HEPTACHLOR 0.050U ALDRIN 0.050U HEPTACHLOR EPOXIDE 0.050U ENDOSULFAN I (ALPHA) 0.10U DIELDRIN 0.10U DIELDRIN 0.10U 4,4'-DDE (P,P'-DDE) 0.10U ENDRIN 0.10U ENDOSULFAN II (BETA) 0.10U 4,4'-DDD (P,P'-DDD) 0.10U ENDOSULFAN SULFATE 0.10U 4,4'-DDT (P,P'-DDT)	0.50U METHOXYCHLOR 0.10U ENDRIN KETONE CHLORDANE (TECH. MIXTURE) /1 0.50U GAMMA-CHLORDANE /2 0.50U ALPHA-CHLORDANE /2 1.0U TOXAPHENE 0.50U PCB-1016 (AROCLOR 1016) 0.50U PCB-1221 (AROCLOR 1221) 0.50U PCB-1232 (AROCLOR 1232) 0.50U PCB-1242 (AROCLOR 1242) 0.50U PCB-1248 (AROCLOR 1242) 0.50U PCB-1248 (AROCLOR 1248) 1.0U PCB-1254 (AROCLOR 1254) 1.0U PCB-1260 (AROCLOR 1260)

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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EPA-REGION IV ESD, ATHENS, GA. 01/04/91 PESTICIDES/PCB'S DATA REPORT PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/16/90 1420 STOP: 00/00/00 ** PROJECT NO. 91-025 SAMPLE NO. 51678 SAMPLE TYPE: SOIL SOURCE: AMAX PHOSPHATE FACIL * * ** ** STATION ID: SD-02 ** CASE NUMBER: 15099 SAS NUMBER: D. NUMBER: Y140 * * ** * * ** UG/KG ANALYTICAL RESULTS UG/KG ANALYTICAL RESULTS 500U METHOXYCHLOR 50U ALPHA-BHC 500 BETA-BHC 500 DELTA-BHC 1000 ENDRIN KETONE CHLORDANE (TECH. MIXTURE) /1 500

GAMMA-CHLORDANE GAMMA-BHC (LINDANE) 500U 50Ŭ HEPTACHLOR 500Ŭ ALPHA-CHLORDANE 500 ALDRIN 10000 TOXAPHENE HEPTACHLOR EPOXIDE PCB-1016 (AROCLOR 1016) 500U PCB-1221 (AROCLOR 1221) ENDOSULFAN I (ALPHA) 500U 50U DIELDRIN PCB-1232 (AROCLOR 1232) 1000 500U PCB-1242 (AROCLOR 1242) PCB-1248 (AROCLOR 1248) PCB-1254 (AROCLOR 1254) PCB-1260 (AROCLOR 1260) 100U 4,4'-DDE (P,P'-DDE) 5000 ENDRIN 1000 500U 1000 ENDOSULFAN II (BETA) 10000 1000 4.4'-DDD (P.P'-DDD) 10000 100U ENDOSULFAN SULFATE PERCENT MOISTURE 100U 4.4'-DDT (P.P'-DDT)

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

^{*}C-CONFIRMED BY GCMS 1. WHEN NO VALUE IS REPORTED. SEE CHLORDANE CONSTITUENTS.

01/04/91

PESTICIDES/PCB'S DATA REPORT	
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** PROJECT NO. 91-025 SAMPLE NO. 51679 SAMPLE TYPE: GROUNDWA PROG ELEM: NSF COLLECTED BY: M GOF	RDON **
	**
** STATION ID: MW-04 COLLECTION START: 10/16/90 1520 S	TOP: 00/00/00 **
** SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO ST: FL ** STATION ID: MW-04 COLLECTION START: 10/16/90 1520 S ** CASE NUMBER: 15099 SAS NUMBER: D. NUMBER: Y327	**
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UG/L ANALYTICAL RESULTS UG/L ANALYTICAL RESUL	.TS
O.OSOU ALPHA-BHC O.SOU METHOXYCHLOR	
O.OSOU BETA-BHC O.10U ENDRIN KETONE	
O.OSOU DELTA-BHC CHLORDANE (TECH. MIXTURE) /1	
O OSOU GAMMA-BHC (LINDANE) O SOU GAMMA-CHLORDANE /2	
O.OSOU HEPTACHLOR O.SOU ALPHA-CHLORDANE /2	
O.OSOU ALDRIN 1.OU TOXAPHENE	
O.OSOU HEPTACHLOR EPOXIDE O.SOU PCB-1016 (AROCLOR 1016)	
0.050U ENDOSULFAN I (ALPHA) 0.50U PCB-1221 (AROCLOR 1221)	
0.10U DIELDRIN 0.50U PCB-1232 (AROCLOR 1232)	
0.10U 4,4'-DDE (P,P'-DDE) 0.50U PCB-1242 (AROCLOR 1242)	
0.10U ENDRIN 0.50U PCB-1248 (AROCLOR 1248)	
0.10U ENDOSULFAN II (BETA) 1.0U PCB-1254 (AROCLOR 1254)	
0.10U 4,4'-DDD (P,P'-DDD) 1.0U PCB-1260 (AROCLOR 1260)	
O.30U ENDOSULFAN SULFATE	
0.10U 4,4'-DDT (P,P'-DDT)	

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN

*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

*C-CONFIRMED BY GCMS

1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

GA.
EPA-REGION IV ESD, ATHENS.
ON IV ESD
EPA-REGI

01/04/91	*******	* * * * * * * * * * * * * * * * * * * *	·
SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD, ATHENS, GA.	* * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * *	220U METHOXYCHLOR 43U ENDRIN KETONE CHLORDANE (TECH. MIXTURE) /1 CHLORDANE /2 220U ALPHA-CHLORDANE /2 220U PCB-1016 (AROCLOR 1016) 220U PCB-1221 (AROCLOR 1221) 220U PCB-1222 (AROCLOR 1222) 220U PCB-1224 (AROCLOR 1242) 220U PCB-1248 (AROCLOR 1248) 430U PCB-1256 (AROCLOR 1254) 430U PCB-1260 (AROCLOR 1256) 26 PERCENT MOISTURE
	PESTICIDES/PCB'S DATA REPORT *** * * * * * * * * * * * * * * * * *	*** * * * * * * * * * * * * * * * * *	22U ALPHA-BHC 22U BETA-BHC 22U DELTA-BHC 22U GAMMA-BHC (LINDANE) 22U HEPTACHLOR 22U HEPTACHLOR EPOXIDE 22U HEPTACHLOR EPOXIDE 22U HEPTACHLOR EPOXIDE 32U HEPTACHLOR EPOXIDE 32U HEPTACHLOR EPOXIDE 32U HEPTACHLOR EPOXIDE 32U HEPTACHLOR 33U LAN II (BETA) 43U 4.4'-DDD (P.P'-DDD) 43U ENDOSULFAN II (BETA) 43U 4.4'-DDD (P.P'-DDD) 43U 4.4'-DDD (P.P'-DDD) 43U 4.4'-DDD (P.P'-DDD)

REMARKS

FOOTNOTES

*A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

*A-AVERAGE VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN

*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATINIT.

*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

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*C-CONFIRMED BY GCMS

REMARKS

01/04/91

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PESTICIDES/PCB'S DATA REPORT
PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/16/90 1535 STOP: 00/00/00
     PROJECT NO. 91-025 SAMPLE NO. 51681 SAMPLE TYPE: SOIL
     SOURCE: AMAX PHOSPHATE FACIL
* *
                                                                                                                                 **
     STATION ID: SB-01
**
                                                                                                                                 **
    CASE NUMBER: 15099
                                 SAS NUMBER:
                                                                      D. NUMBER: Y139
* *
                                                                                                                                 **
* *
                                                                                                                                 * *
   UG/KG
                       ANALYTICAL RESULTS
                                                                      UG/KG
                                                                                         ANALYTICAL RESULTS
     20U ALPHA-BHC
                                                                      200U METHOXYCHLOR
    200 BETA-BHC
200 DELTA-BHC
                                                                       39U ENDRIN KETONE
                                                                           CHLORDANE (TECH. MIXTURE) /1
GAMMA-CHLORDANE /2
     200
         GAMMA-BHC (LINDANE)
                                                                      200U
         HEPTACHLOR
                                                                      200U
                                                                            ALPHA-CHLORDANE
     20U
                                                                           TOXAPHENE
     200
         ALDRIN
                                                                      390U
         HEPTACHLOR EPOXIDE
     200
                                                                      2000
                                                                           PCB-1016 (AROCLOR 1016)
     200
         ENDOSULFAN I (ALPHA)
                                                                           PCB-1221 (AROCLOR 1221)
PCB-1232 (AROCLOR 1232)
                                                                      200U
         DIELDRIN
                                                                      2000
                                                                     2000 PCB-1232 (AROCLOR 1232)
2000 PCB-1242 (AROCLOR 1242)
2000 PCB-1248 (AROCLOR 1248)
3900 PCB-1254 (AROCLOR 1254)
3900 PCB-1260 (AROCLOR 1260)
18 PERCENT MOISTURE
         4,4'-DDE (P,P'-DDE)
ENDRIN
     39U
     390
     39U
         ENDOSULFAN II (BETA)
     390
         4,4'-DDD (P,P'-DDD)
     390
        ENDOSULFAN SULFATE
     39U 4,4'-DDT (P,P'-DDT)
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REMARKS

REMARKS

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*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

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*C-CONFIRMED BY GCMS

1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

EPA-REGION IV ESD, ATHENS, GA. 01/04/91 DECTICIDES (DCB/S DATA DEDORT

** PROJECT NO. 91-025 SAMPLE NO ** SOURCE: AMAX PHOSPHATE FACIL ** STATION ID: MW-06 ** CASE NUMBER: 15099 SAS	. 51682 SAMPLE TYPE: GROUNDWA NUMBER:	* * * * * * * * * * * * * * * * * * *
UG/L ANALYTICAL R	=	UG/L ANALYTICAL RESULTS
O.OSOU ALPHA-BHC O.OSOU BETA-BHC O.OSOU DELTA-BHC O.OSOU GAMMA-BHC (LINDANE) O.OSOU HEPTACHLOR O.OSOU ALDRIN O.OSOU HEPTACHLOR EPOXIDE O.OSOU ENDOSULFAN I (ALPHA) O.1OU DIELDRIN O.1OU 4,4'-DDE (P,P'-DDE) O.1OU ENDRIN O.1OU ENDRIN O.1OU ENDOSULFAN II (BETA) O.1OU 4,4'-DDD (P,P'-DDD) O.1OU ENDOSULFAN SULFATE O.1OU 4,4'-DDT (P,P'-DDT)		0.50U METHOXYCHLOR 0.10U ENDRIN KETONE CHLORDANE (TECH. MIXTURE) /1 0.50U GAMMA-CHLORDANE /2 0.50U ALPHA-CHLORDANE /2 1.0U TOXAPHENE 0.50U PCB-1016 (AROCLOR 1016) 0.50U PCB-1221 (AROCLOR 1221) 0.50U PCB-1232 (AROCLOR 1232) 0.50U PCB-1242 (AROCLOR 1242) 0.50U PCB-1248 (AROCLOR 1242) 0.50U PCB-1248 (AROCLOR 1248) 1.0U PCB-1254 (AROCLOR 1254) 1.0U PCB-1260 (AROCLOR 1260)

REMARKS

REMARKS

FOOTNOTES

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*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
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*C-CONFIRMED BY GCMS
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EPA-REGION IV ESD. ATHENS. GA. 01/04/91

** SOURCE: AMAX PHOSPHATE FACIL ** STATION ID: TW-01 ** CASE NUMBER: 15099 SAS NUMBER: ** ** ** ** ** ** ** ** **	**
UG/L ANALYTICAL RESULTS 0.050U ALPHA-BHC 0.050U BETA-BHC 0.050U DELTA-BHC 0.050U GAMMA-BHC (LINDANE) 0.050U HEPTACHLOR 0.050U ALDRIN 0.050U ALDRIN 0.050U HEPTACHLOR EPOXIDE 0.050U ENDOSULFAN I (ALPHA) 0.10U DIELDRIN 0.10U DIELDRIN 0.10U DIELDRIN 0.10U DIELDRIN 0.10U A, 4'-DDE (P,P'-DDE) 0.10U ENDOSULFAN II (BETA) 0.10U ENDOSULFAN II (BETA) 0.10U ENDOSULFAN II (BETA) 0.10U ENDOSULFAN II (BETA) 0.10U ENDOSULFAN II (BETA) 0.50U PCB-1248 (AROCLOR 1248) 0.50U PCB-1254 (AROCLOR 1254)	

REMARKS

REMARKS

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

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*C-CONFIRMED BY GCMS

1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

01/04/91

PESTICIDES/PCB'S	DATA REPORT	ETA REGION IV ESD, ATT	icito, da.	01/04/01
*** * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * 91-025	MPLE TYPE: GROUNDWA PROC CITY COLL	ECTION START: 10/17/90 0935 STOP	** */ **
*** * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * UG/U		* * * * * * * * * * * * * * * * * * * *
0.050U HEPTACH 0.050U ALDRIN 0.050U HEPTACH 0.050U ENDOSUL 0.10U DIELDR 0.10U 4,4'-DI 0.10U ENDRIN 0.10U ENDOSUL 0.10U 4,4'-DI 0.10U ENDOSUL	HC BHC BHC (LINDANE) HLOR HLOR EPOXIDE LFAN I (ALPHA) IN DE (P,P'-DDE)	0.500 0.100 0.500 1.00 0.500 0.500 0.500 0.500 1.00	CHLORDANE (TECH. MIXTURE) /1 J GAMMA-CHLORDANE /2 J ALPHA-CHLORDANE /2 J TOXAPHENE J PCB-1016 (AROCLOR 1016) J PCB-1221 (AROCLOR 1221) J PCB-1232 (AROCLOR 1232) J PCB-1242 (AROCLOR 1242) J PCB-1248 (AROCLOR 1248) J PCB-1254 (AROCLOR 1254)	

REMARKS

REMARKS

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*C-CONFIRMED BY GCMS

1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

01/04/91 PESTICIDES/PCB'S DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51685 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON ÷± ST: FL SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO ** * * COLLECTION START: 10/17/90 0925 STOP: 00/00/00 ** STATION ID: SS-02 ** SAS NUMBER: ** CASE NUMBER: 15099 D. NUMBER: Y144 ** * * * * UG/KG ANALYTICAL RESULTS UG/KG ANALYTICAL RESULTS 17U ALPHA-BHC 170U METHOXYCHLOR 17Ŭ BETA-BHC 350 ENDRIN KETONE DELTA-BHC 17Ü CHLORDANE (TECH. MIXTURE) /1 GAMMA-BHC (LINDANE) GAMMA-CHLORDANE 17U HEPTACHLOR 17U 52J ALPHA-CHLORDANE 170 ALDRIN 350U TOXAPHENE PCB-1242 (AROCLOR 1242)
PCB-1242 (AROCLOR 1232)
PCB-1242 (AROCLOR 1242)
PCB-1242 (AROCLOR 1242)
PCB-1248 (AROCLOR 1248)
PCB-1254 (AROCLOR 1254)
PCB-1260 (AROCLOR 1260) HEPTACHLOR EPOXIDE 170 1700 ENDOSULFAN I (ALPHA) 170 170U 35U DIELDRIN 1700 4.4'-DDE (P.P'-DDE) 39 170U 35Ŭ ENDRIN 1700 ENDOSULFAN II (BETA) 3500

REMARKS

4.4'-DDD (P.P'-DDD)

4.4'-DDT (P.P'-DDT)

ENDOSULFAN SULFATE

REMARKS

350U

PERCENT MOISTURE

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EPA-REGION IV ESD, ATHENS, GA. 01/04/91 PESTICIDES/PCB'S DATA REPORT

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PROJECT NO. 91-025 SAMPLE NO. 51686 SAMPLE TYPE: SOIL
                                                               PROG ELEM: NSF COLLECTED BY: M GORDON
* *
                                                               CITY: PALMETTO
                                                                                        ST: FL
                                                                                                                     * *
                                                               COLLECTION START: 10/17/90 0945 STOP: 00/00/00
    STATION ID: SB-02
* *
                                                                                                                     **
    CASE NUMBER: 15099
                             SAS NUMBER:
                                                                D. NUMBER: Y145
**
                                                                                                                    **
* *
                                                                                                                    **
   ANALYTICAL RESULTS
   UG/KG
                     ANALYTICAL RESULTS
                                                               UG/KG
    19U ALPHA-BHC
                                                               190U METHOXYCHLOR
    19U BETA-BHC
                                                                38U ENDRIN KETONE
        DELTA-BHC
GAMMA-BHC (LINDANE)
    190
                                                                    CHLORDANE (TECH. MIXTURE) /1
                                                                    GAMMA-CHLORDANE
ALPHA-CHLORDANE
    190
                                                               190U
        HEPTACHLOR
    190
                                                               1900
    190
        ALDRIN
                                                               3800
                                                                    TOXAPHENE
                                                                    PCB-1016 (AROCLOR 1016)
PCB-1221 (AROCLOR 1221)
    190
        HEPTACHLOR EPOXIDE
                                                               190U
    190
        ENDOSULFAN I (ALPHA)
                                                               1900
                                                                    PCB-1232 (AROCLOR 1232)
PCB-1242 (AROCLOR 1242)
PCB-1248 (AROCLOR 1248)
        DIELDRIN
    380
                                                               190U
    380
        4,4'-DDE (P,P'-DDE)
                                                               1900
    380
        ENDRIN
                                                               1900
        ENDOSULFAN II (BETA)
4,4'-DDD (P,P'-DDD)
ENDOSULFAN SULFATE
                                                                    PCB-1254 (AROCLOR 1254)
PCB-1260 (AROCLOR 1260)
    380
                                                               3800
                                                               3800
    380
                                                                    PERCENT MOISTURE
        4,4'-DDT (P,P'-DDT)
```

REMARKS

REMARKS

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*C-CONFIRMED BY GCMS
1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

EPA-REGION IV ESD, ATHENS, GA. 01/04/91 PESTICIDES/PCB'S DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51687 SAMPLE TYPE: GROUNDWA PROG ELEM: NSF COLLECTED BY: M GORDON * * ** % SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO ST: FL ** CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 0900 STOP: 00/00/00 * * STATION ID: MW-03 * * * * SAS NUMBER: ** CASE NUMBER: 15099 D. NUMBER: Y328 ** * * ** UG/L ANALYTICAL RESULTS UG/L ANALYTICAL RESULTS 0.050U ALPHA-BHC O.50U METHOXYCHLOR 0.0500 BETA-BHC 0.100 ENDRIN KETONE DELTA-BHC 0.0500 CHLORDANE (TECH. MIXTURE) /1 GAMMA-CHLORDANE 0.0500 GAMMA-BHC (LINDANE) 0.500 /2 0.0500 HEPTACHLOR 0.500 ALPHA-CHLORDANE TOXAPHENE 0.0500 ALDRIN 1.00 PCB-1016 (AROCLOR 1016) PCB-1221 (AROCLOR 1221) PCB-1232 (AROCLOR 1232) PCB-1242 (AROCLOR 1242) PCB-1248 (AROCLOR 1248) PCB-1254 (AROCLOR 1254) HEPTACHLOR EPOXIDE 0.0500 0.500 ENDOSULFAN I (ALPHA) 0.0500 0.500 0.100 DIELDRIN 0.500 4.4'-DDE (P.P'-DDE) 0.500 0.100 ENDRIN 0.100 ENDOSULFAN II (BETA) 4,4'-DDD (P,P'-DDD)

1.00

1.00

PCB-1260 (AROCLOR 1260)

REMARKS

0.100

0.100

0.200

0.100

ENDOSULFAN SULFATE

4.4'-DDT (P.P'-DDT)

REMARKS

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01/04/91

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PESTICIDES/PCB'S DATA REPORT
PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1045 STOP: 00/00/00
    PROJECT NO. 91-025 SAMPLE NO. 51688 SAMPLE TYPE: SOIL
* *
     SOURCE: AMAX PHOSPHATE FACIL
**
                                                                                                                            **
    STATION ID: SD-10
* *
                                                                                                                            **
    CASE NUMBER: 15099
                               SAS NUMBER:
                                                                    D. NUMBER: Y150
**
                                                                                                                            **
                                                                                                                            **
UG/KG
                      ANALYTICAL RESULTS
                                                                   UG/KG
                                                                                      ANALYTICAL RESULTS
                                                                   300U METHOXYCHLOR
    30U ALPHA-BHC
    300 BETA-BHC
300 DELTA-BHC
                                                                    59Ú
                                                                         ENDRIN KETONE
                                                                         CHLORDANE (TECH. MIXTURE) /1
         GAMMA-BHC (LINDANE)
                                                                         GAMMA-CHLORDANE
                                                                   3000
     300
     30Ú
         HEPTACHLOR
                                                                   3000
                                                                         ALPHA-CHLORDANE
     300
         ALDRIN
                                                                   590U
                                                                         TOXAPHENE
                                                                        PCB-1254 (AROCLOR 1254)
PCB-1254 (AROCLOR 1221)
PCB-1232 (AROCLOR 1232)
PCB-1242 (AROCLOR 1242)
PCB-1248 (AROCLOR 1248)
PCB-1254 (AROCLOR 1254)
PCB-1260 (AROCLOR 1254)
         HEPTACHLOR EPOXIDE
                                                                   3000
     30U
         ENDOSULFAN I (ALPHA)
                                                                   3000
     300
     59U DIELDRIN
                                                                   3000
         4,4'-DDE (P,P'-DDE)
ENDRIN
    59U
                                                                   3000
    59U
                                                                   3000
                                                                   590Ŭ
    59Ú
         ENDOSULFAN II (BETA)
    59U
         4.4'-DDD (P.P'-DDD)
                                                                   590U
    59U ENDOSULFAN SULFATE
                                                                        PERCENT MOISTURE
    59U 4.4'-DDT (P.P'-DDT)
```

REMARKS

REMARKS

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*C-CONFIRMED BY GCMS 1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

01/04/91

PESTICIDES/PCB'S DATA REPORT		
*** * * * * * * * * * * * * * * * * *	E: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1020 STOP: 00/00/00 D. NUMBER: Y148	* * * * ***
UG/KG ANALYTICAL RESULTS 20U ALPHA-BHC 20U BETA-BHC 20U DELTA-BHC 20U GAMMA-BHC (LINDANE) 20U HEPTACHLOR 20U ALDRIN 20U HEPTACHLOR EPOXIDE 20U ENDOSULFAN I (ALPHA) 40U DIELDRIN 40U 4.4'-DDE (P,P'-DDE) 40U ENDOSULFAN II (BETA) 40U 4.4'-DDD (P,P'-DDD) 40U ENDOSULFAN SULFATE 40U 4.4'-DDT (P,P'-DDT)	**************************************	

REMARKS

REMARKS

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*C-CONFIRMED BY GCMS

1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

01/04/91 PESTICIDES/PCB'S DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51690 SAMPLE TYPE: GROUNDWA PROG ELEM: NSF COLLECTED BY: M GORDON * * ** 1 ST: FL SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO ** COLLECTION START: 10/17/90 1040 STOP: 00/00/00 STATION ID: TW-02 * * ** CASE NUMBER: 15099 SAS NUMBER: * * D. NUMBER: Y146 * * * * **

UG/L ANALYTICAL RESULTS UG/L ANALYTICAL RESULTS 0.10U ALPHA-BHC 1.OU METHOXYCHLOR O. 10U BETA-BHC ENDRIN KETONE 0.200 O. 100 DELTA-BHC CHLORDANE (TECH. MIXTURE) /1
1.OU GAMMA-CHLORDANE /2 0.100 GAMMA-BHC (LINDANE) O. 100 HEPTACHLOR ALPHA-CHLORDANE 1.00 0.100 ALDRIN TOXAPHENE 2.00 PCB-121 (AROCLOR 1016) PCB-1221 (AROCLOR 1221) PCB-1232 (AROCLOR 1232) PCB-1242 (AROCLOR 1242) PCB-1248 (AROCLOR 1248) HEPTACHLOR EPOXIDE ENDOSULFAN I (ALPHA) 0.100 1.00 0.100 1.00 DIELDRIN 0.200 1.00 0. 20U 4.4'-DDE (P.P'-DDE) 1.00 ENDRIN 0.200 1.00 ENDOSULFAN II (BETA) 4,4'+DDD (P,P'-DDD) PCB-1254 (AROCLOR 1254) PCB-1260 (AROCLOR 1260) 0.200 2.00 0.200 2.00 0.200 ENDOSULFAN SULFATE 0.20U 4.4'-DDT (P.P'-DDT)

REMARKS

FOOTNOTES

REMARKS

*A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.
*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.
*C-CONFIRMED BY GCMS 1. WHEN NO VALUE IS REPORTED, SEE CHLORDANE CONSTITUENTS.

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AMAX Phosphate Facility FLD043055151

SITE AMAX PHOSPHA PROJECT # 91-025	TE (FI	T)	S	TATE	FL			ROGER FRANKLIN 10/15/90	(NUS)
SOILVOA BOOKED	29	DATA	RECEIVED	/	/	FOR		SAMPLES	
H2OVOA BOOKED	24	DATA	RECEIVED	/	/	FOR		SAMPLES	
SOILEXT BOOKED	28	DATA	RECEIVED	/	/	FOR		SAMPLES	
H2OEXT BOOKED	24	DATA	RECEIVED	/	/	FOR		SAMPLES	
SOILPEST BOOKED	28	DATA	RECEIVED	/	/	FOR		SAMPLES	
H2OPEST BOOKED	24	DATA	RECEIVED	/	/	FOR		SAMPLES	
SOILMET BOOKED	28	DATA	RECEIVED	12/	10/90	FOR	24	SAMPLES	
H2OMET BOOKED	24	DATA	RECEIVED	12/	10/90	FOR	21	SAMPLES	
SOILCN BOOKED	28	DATA	RECEIVED	12/	10/90	FOR	24	SAMPLES	
H2OCN BOOKED	24	DATA	RECEIVED	12/	10/90	FOR	21	SAMPLES	
SOILOTH1 BOOKED	7	DATA	RECEIVED	/	/	FOR		SAMPLES	
SOILOTH2 BOOKED	0	DATA	RECEIVED	/	/	FOR		SAMPLES	
H200TH1 BOOKED	7	DATA	RECEIVED	/	/	FOR		SAMPLES	
H200TH2 B00KED	O	DATA	RECEIVED	/	/	FOR		SAMPLES	
OTHER1 BOOKED	ō	DATA	RECEIVED	/	/	FOR		SAMPLES	
OTHER2 BOOKED	Ö	DATA	RECEIVED	/	/	FOR		SAMPLES	
OV REQUESTED? N									



LAB(CLP/ESD)

clp

SISB/SAS DEC 1 1 1990 EPA . REGION I' 4 mt 2 2 ---

UNITED STATES ENVIRONMENTAL PROTECTION Region IV

Environmental Services Division College Station Road, Athens, Ga. 30613

*****MEMORANDUM*****

DATE: 12/05/90

Results of Specified Analysis; 91-025 AMAX PHOSPHATE FACIL SUBJECT:

PALMETTO

CASE NO: 15099

FROM: Robert W. Knight

Chief, Laboratory Evaluation/Quality Assurance Section

TO: PHIL BLACKWELL

Attached are the results of analysis of samples collected as part of the subject project.

As a result of the Quality Assurance Review, certain data qualifiers may have been placed on the data. Attached is a DATA QUALIFIER REPORT which explains the reasons that these qualifiers were required.

If you have any questions please contact me.

ATTACHMENT

INORGANIC DATA QUALIFIERS REPORT

Case Number: 15099
Project Number: 91-025
Site: Amax Phosphate Facil., Palmetto, FL

Element	Flag	Samples_Affected	Reason
A. Water As, Cd, Pb, Se, V	U	All positives > IDL but < CRDL	Baseline instability
Al, Ba, Ca, Cu, Fe, Mg, Mn, K, Na, Zn	Ū	All positives > IDL but < 10x contaminant level	Positives in Blanks
нд	J	All positives	Matrix spike recovery = 154%
Ag	J	A11	Matrix spike recovery = 71.3%
Tl	J R	All positives All negatives	Matrix spike recovery = 12.1%
Fe	J	A11	Serial dilution percent difference = 17.8%
Нд	J	MDY325	Technical holding time exceeded
CN	J	MDY326-329	Technical holding time exceeded
Zn	J	All positives	Blind spike recovery = 180%
As	J	MDY327-329	Calibration curve $r < .995$
Se	J	SDG MDY137, and MDY327-329	Calibration curve r <.995
B. Soils As, Cd, Pb, Se,	U	All positives > IDL but < CRDL	Baseline instability
Al, Ba, Ca, Cu, Fe, Mg, Mn, K, Na, Zn	Ū	All positives > IDL but < 10x contaminant level	Positives in Blanks
As	J R	All positives All negatives	Matrix spike recovery = 0%
Se	J R	All positives All negatives	Matrix spike recovery = 0%
Ag	J	A11	Matrix spike recovery = 74.1%
Tl	J	MDY162	Duplicate MSA r $<.995$
Cu	J	A11	Matrix duplicate RPD = 105.2%
Fe	J	All	Matrix duplicate RPD = 42.6%
Pb	J	A11	Matrix duplicate RPD = 47.4%
Zn	J	All positives	Blind spike recovery = 180%

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

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PROJECT NO. 91-025 SAMPLE NO. 51642 SAMPLE TYPE: GROUNDWA PROG ELEM: NSF COLLECTED BY: M GORDON ST: FL ** **

CITY: PALMETTO ST: FL
COLLECTION START: 10/15/90 0630 STOP: 00/00/00
D. NO.: Y325 MD NO: Y325

STATION ID: PB-01 CASE.NO.: 15099 SAS NO.: ** ** ** **

RESULTS UNITS PARAMETER 10U UG/L CYANIDE

REMARKS RECOMMENDED HOLDING TIME EXCEEDED-HG ***REMARKS***

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

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PROJECT NO. 91-025 SAMPLE NO. 51643 SAMPLE TYPE: SOIL ** **

PROG ELEM: NSF COLLECTED BY: M GORDON

CITY: PALMETTO ST: FL COLLECTION START: 10/15/90 1655 STOP: 00/00/00

SOURCE: AMAX PHOSPHATE FACIL STATION ID: SD-05 CASE .NO .: 15099 SAS NO.:

D. NO.: Y168

MD NO: Y168

RESULTS UNITS PARAMETER 1.5U MG/KG CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

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PROJECT NO. 91-025 SAMPLE NO. 51644 SAMPLE TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON ** **

SOURCE: AMAX PHOSPHATE FACIL

CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1645 STOP: 00/00/00 D. NO.: Y169 MD NO: Y169 STATION ID: SW-05 CASE.NO.: 15099

** SAS NO.: ** **

> RESULTS UNITS PARAMETER 10U UG/L CYANIDE

FOOTNOTES *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

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PROJECT NO. 91-025 PROG ELEM: NSF SAMPLE NO. 51645 SAMPLE TYPE: SOIL COLLECTED BY: M GORDON **

SOURCE: AMAX PHOSPHATE FACIL

CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1630 STOP: 00/00/00 STATION ID: SD-04 CASE.NO .: 15099 SAS NO.: D. NO.: Y166 MD NO: Y166

> RESULTS UNITS PARAMETER 1.2U MG/KG CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

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PROJECT NO. 91-025 SAMPLE NO. 51646 SAMPLE TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1620 STOP: 00/00/00 D. NO.: Y167 MD NO: Y167 CASE NO .: 15099 SAS NO.:

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> RESULTS UNITS PARAMETER 20U UG/L CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

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PROJECT NO. 91-025 SAMPLE SOURCE: AMAX PHOSPHATE FACIL STATION ID: SW-08 SAMPLE NO. 51647 SAMPLE TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON ** **

CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1605 STOP: 00/00/00 D. NO.: Y165 MD NO: Y165

CASE NO .: 15099 SAS NO.: ** ** ** **

> RESULTS UNITS PARAMETER 100 UG/L CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

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PROJECT NO. 91-025 SAMPLE NO. 51648 SAMPLE TYPE: SOIL STATION ID: SD-08 PROG ELEM: NSF COLLECTED BY: M GORDON ** **

CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1610 STOP: 00/00/00

MD NO: Y164 CASE NO .: 15099 SAS NO.: D. NO.: Y164 ** ** ** **

RESULTS UNITS PARAMETER 1.5U MG/KG CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

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PROG ELEM: NSF PROJECT NO. 91-025 SAMPLE NO. 51649 SAMPLE TYPE: SOIL COLLECTED BY: M GORDON **

SOURCE: AMAX PHOSPHATE FACIL

CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1505 STOP: 00/00/00 D. NO.: Y159 MD NO: Y159 STATION ID: SD-11 CASE.NO.: 15099 SAS NO.:

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RESULTS UNITS PARAMETER 2U MG/KG CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

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SAMPLE NO. 51650 SAMPLE TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON PROJECT NO. 91-025 ** **

SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1445 STOP: 00/00/00

MD NO: Y158 ** CASE.NO.: 15099 SAS NO.: D. NO.: Y158 **

RESULTS UNITS PARAMETER 10U UG/L CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

PROJECT NO. 91-025 SAMPLE NO. 51651 SAMPLE TYPE: SURFACEWA PROG ELEM: NST SOURCE: AMAX PHOSPHATE FACIL STATION ID: SW-09 COLIFCTION STAR COLLECTED BY: M GORDON **

CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1515 STOP: 00/00/00 D. NO.: Y163 MD NO: Y163 ** CASE.NO.: 15099 SAS NO.: ** **

RESULTS UNITS PARAMETER 10U UG/L CYANIDE

FOOTNOTES *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1530 STOP: 00/00/00 D. NO.: Y162 MD NO: Y162 PROJECT NO. 91-025 SAMPLE SOURCE: AMAX PHOSPHATE FACIL STATION ID: SD-09 SAMPLE NO. 51652 SAMPLE TYPE: SOIL ** ** ** ** CASE.NO.: 15099 SAS NO.: ** **

RESULTS UNITS PARAMETER 2.2U MG/KG CYANIDE

FOOTNOTES

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^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

PROJECT NO. 91-025 SAMPLE SOURCE: AMAX PHOSPHATE FACIL STATION ID: SD-07 SAMPLE NO. 51653 SAMPLE TYPE: SOIL

PROG ELEM: NSF COLLECTED BY: M GORDON

CASE NO.: 15099

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SAS NO.:

CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1520 STOP: 00/00/00 MD NO: Y160 D. NO.: Y160

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> RESULTS UNITS PARAMETER 1.3U MG/KG CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

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PROJECT NO. 91-025 SAMPLE NO. 51654 SAMPLE TYPE: SURFACEWA PROG ELEM: NSF CITY: PALMETTO COLLECTION STATION ID: SW-07 COLLECTION STATI

COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1515 STOP: 00/00/00

CASE.NO.: 15099 SAS NO.: D. NO.: Y161

MD NO: Y161

RESULTS UNITS PARAMETER 14 UG/L CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

SPECIFIED ANALYSIS DATA REPORT

PROJECT NO. 91-025 PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL SAMPLE NO. 51655 SAMPLE TYPE: SOIL SOURCE: AMAX PHOSPHATE FACIL ST: FL ** COLLECTION START: 10/17/90 1445 STOP: 00/00/00

STATION ID: SD-06 CASE.NO.: 15099 ** ** D. NO.: Y156 MD NO: Y156 ** SAS NO.: ** ** **

> RESULTS UNITS PARAMETER 1.3U MG/KG CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

SAS NO.:

CASE.NO.: 15099

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PROJECT NO. 91-025 SAMPLE SOURCE: AMAX PHOSPHATE FACIL STATION ID: SW-06 SAMPLE NO. 51656 SAMPLE TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON **

CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1440 STOP: 00/00/00 D. NO.: Y157 MD NO: Y157

RESULTS UNITS PARAMETER 10U UG/L CYANIDE

^{*}A-AVERAGE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

CASE.NO.: 15099

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*** PROJECT NO. 91-025 SAMPLE NO. 51661 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON SOURCE: AMAX PHOSPHATE FACIL

SAS NO.:

CITY: PALMETTO ST: FL COLLECTION START: 10/18/90 1030 STOP: 00/00/00 D. NO.: Y174 MD NO: Y174

RESULTS UNITS PARAMETER 1.2U MG/KG CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

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PROJECT NO. 91-025 SAMPLE NO. 51662 SAMPLE TYPE: GROUNDWA PROG ELEM: NSF COLLECTED BY: M GORDON

SOURCE: AMAX PHOSPHATE FACIL STATION ID: TW-04

CITY: PALMETTO ST: FL COLLECTION START: 10/18/90 1040 STOP: 00/00/00 D. NO.: Y175 MD NO: Y175

CASE.NO.: 15099 SAS NO.:

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RESULTS UNITS PARAMETER 10U UG/L CYANIDE

FOOTNOTES *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

CASE.NO.: 15099

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PROJECT NO. 91-025 SAMPLE NO. 51663 SAMPLE TYPE: SOIL SOURCE: AMAX PHOSPHATE FACIL STATION ID: 55-04 ** **

SAS NO.:

PROG ELEM: NSF COLLECTED BY: M GORDON

CITY: PALMETTO ST: FL COLLECTION START: 10/18/90 1020 STOP: 00/00/00 D. NO.: Y173 MD NO: Y173

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> RESULTS UNITS PARAMETER 1.3U MG/KG CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

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PROG ELEM: NSF COLLECTED BY: M GORDON PROJECT NO. 91-025 SAMPLE NO. 51664 SAMPLE TYPE: GROUNDWA

SOURCE: AMAX PHOSPHATE FACIL STATION ID: TW-05 CITY: PALMETTO ST: FL

COLLECTION START: 10/18/90 0930 STOP: 00/00/00 D. NO.: Y172 MD NO: Y172 ** CASE.NO.: 15099 SAS NO.: **

RESULTS UNITS PARAMETER 10U UG/L CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

PROJECT NO. 91-025 SAMPLE NO. 51665 SAMPLE TYPE: SOIL SOURCE: AMAX PHOSPHATE FACIL STATION ID: SB-05 PROG ELEM: NSF COLLECTED BY: M GORDON **

CITY: PALMETTO ST: FL COLLECTION START: 10/18/90 0910 STOP: 00/00/00 D. NO.: Y171 MD NO: Y171 **

** CASE.NO.: 15099 SAS NO.: ** ** **

> RESULTS UNITS PARAMETER 1.2U MG/KG CYANIDE

FOOTNOTES *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

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PROJECT NO. 91-025 SAMPLE SOURCE: AMAX PHOSPHATE FACIL STATION ID: SS-05 SAMPLE NO. 51666 SAMPLE TYPE: SOIL **

PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/18/90 0900 STOP: 00/00/00

CASE . NO .: 15099 SAS NO.: D. NO.: Y170 MD NO: Y170 ** * * ** **

> RESULTS UNITS PARAMETER 1.20 MG/KG CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

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PROJECT NO. 91-025 SAMPLE SOURCE: AMAX PHOSPHATE FACIL STATION ID: SS-07 SAMPLE NO. 51667 SAMPLE TYPE: SOIL **

PROG ELEM: NSF COLLECTED BY: M GORDON

CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1150 STOP: 00/00/00 D. NO.: Y153 MD NO: Y153

CASE .NO.: 15099 SAS NO.: ** ** ** **

> RESULTS UNITS PARAMETER 1.20 MG/KG CYANIDE

FOOTNOTES *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

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PROJECT NO. 91-025 SAMPLE NO. 51668 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON

SOURCE: AMAX PHOSPHATE FACIL

CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1205 STOP: 00/00/00 D. NO.: Y152 MD NO: Y152 STATION ID: SS-06 CASE.NO.: 15099 SAS NO.:

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RESULTS UNITS PARAMETER 1.3U MG/KG CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

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PROJECT NO. 91-025 SAMPLE NO. 51669 SAMPLE TYPE: SOIL SOURCE: AMAX PHOSPHATE FACIL STATION ID: SD-12 CASE.NO.: PROG ELEM: NSF COLLECTED BY: M GORDON ** **

CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1230 STOP: 00/00/00 D. NO.: Y154 MD NO: Y154

RESULTS UNITS PARAMETER 1.6U MG/KG CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

PROJECT NO. 91-025 SAMPLE NO. 51670 SAMPLE TYPE: SOIL SOURCE: AMAX PHOSPHATE FACIL

PROG ELEM: NSF COLLECTED BY: M GORDON

STATION ID: SB-06 CASE.NO.: 15099

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SAS NO.:

CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1215 STOP: 00/00/00 D. NO.: Y155 MD NO: Y155

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> RESULTS UNITS PARAMETER 1.2U MG/KG CYANIDE

FOOTNOTES *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51671 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON **

SOURCE: AMAX PHOSPHATE FACIL STATION ID: SB-03 CASE.NO.: 15099 SAS CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1135 STOP: 00/00/00 D. NO.: Y149 MD NO: Y149 ** ** SAS NO.:

RESULTS UNITS PARAMETER 1.3U MG/KG CYANIDE

^{*}A-ÁVERÃĞE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

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PROJECT NO. 91-025 SAMPLE NO. 51672 SAMPLE TYPE: GROUNDWA PROG ELEM: NSF COLLECTED BY: M GORDON **

SOURCE: AMAX PHOSPHATE FACIL

CITY: PALMETTO ST: FL
COLLECTION START: 10/17/90 1145 STOP: 00/00/00
D. NO.: Y151 MD NO: Y151 STATION ID: TW-03 CASE.NO.: 15099 SAS NO.:

RESULTS UNITS PARAMETER 10U UG/L CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

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PROJECT NO. 91-025 SAMPLE NO. 51673 SAMPLE TYPE: GROUNDWA PROG ELEM: NSF COLLECTED BY: M GORDON **

SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO ST: FL

STATION ID: MW-01 COLLECTION START: 10/16/90 1130 STOP: 00/00/00 MD NO: Y326 CASE.NO .: 15099 D. NO.: Y326 SAS NO.:

> RESULTS UNITS PARAMETER 10UJ UG/L CYANIDE

REMARKS HOLDING TIME EXCEEDED-CN ***REMARKS***

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

PROJECT NO. 91-025 SAMPLE NO. 51674 SAMPLE TYPE: SURFACEWA PROG ELEM: NSF SOURCE: AMAX PHOSPHATE FACIL STATION ID: SW-01 SPECIFIED ANALYSIS DATA REPORT COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/16/90 1330 STOP: 00/00/00 D. NO.: Y137 MD NO: Y137 ** ** ** ** ** CASE.NO.: 15099 SAS NO.: ** ** **

RESULTS UNITS PARAMETER 10U UG/L CYANIDE

FOOTNOTES

*A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN

*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51675 SAMPLE TYPE: SOIL SOURCE: AMAX PHOSPHATE FACIL STATION ID: SD-01 CASE.NO.: 15099 SAS NO.: PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/16/90 1335 STOP: 00/00/00 D. NO.: Y136 MD NO: Y136 ** **

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RESULTS UNITS PARAMETER 1.3U MG/KG CYANIDE

FOOTNOTES *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

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PROJECT NO. 91-025 SAMPLE NO. 51676 SAMPLE TYPE: GROUNDWA PROG ELEM: NSF COLLECTED BY: M GORDON ** SOURCE: AMAX PHOSPHATE FACIL STATION ID: MW-05 **

CITY: PALMETTO ST: FL COLLECTION START: 10/16/90 1350 STOP: 00/00/00 D. NO.: Y329 MD NO: Y329

CASE . NO . : 15099 ** SAS NO.: **

> RESULTS UNITS PARAMETER 10UJ UG/L CYANIDE

REMARKS HOLDING TIME EXCEEDED-CN ***REMARKS***

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

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PROJECT NO. 91-025 SAMPLE SOURCE: AMAX PHOSPHATE FACIL STATION ID: SW-02 SAMPLE NO. 51677 SAMPLE TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON ** **

CITY: PALMETTO ST: FL COLLECTION START: 10/16/90 1415 STOP: 00/00/00 . D. NO.: Y141 MD NO: Y141

** CASE.NO.: 15099 SAS NO.: ** ** **

RESULTS UNITS PARAMETER 10U UG/L CYANIDE

FOOTNOTES *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

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PROJECT NO. 91-025 SAMPLE NO. 51678 SAMPLE TYPE: SOIL **

PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/16/90 1420 STOP: 00/00/00 D. NO.: Y140 MD NO: Y140 SOURCE: AMAX PHOSPHATE FACIL STATION ID: SD-02 CASE .NO .: 15099 SAS NO.:

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> RESULTS UNITS PARAMETER 3.2U MG/KG CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

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SAMPLE NO. 51679 SAMPLE TYPE: GROUNDWA PROJECT NO. 91-025 PROG ELEM: NSF COLLECTED BY: M GORDON ** SOURCE: AMAX PHOSPHATE FACIL STATION ID: MW-04 **

CITY: PALMETTO ST: FL

COLLECTION START: 10/16/90 1520 STOP: 00/00/00 D. NO.: Y327 MD NO: Y327

CASE.NO.: 15099 SAS NO.: **

> RESULTS UNITS PARAMETER 10UJ UG/L CYANIDE

REMARKS HOLDING TIME EXCEEDED-CN ***REMARKS***

FOOTNOTES *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

CASE.NO.: 15099

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PROJECT NO. 91-025 SAMPLE NO. 51680 SAMPLE TYPE: SOIL SOURCE: AMAX PHOSPHATE FACIL STATION ID: SS-01 PROG ELEM: NSF COLLECTED BY: M GORDON **

SAS NO.:

CITY: PALMETTO ST: FL
COLLECTION START: 10/16/90 1520 STOP: 00/00/00
D. NO.: Y138 MD NO: Y138

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RESULTS UNITS PARAMETER 1.4U MG/KG CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51681 SAMPLE TYPE: SOIL **

SAS NO.:

PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL
COLLECTION START: 10/16/90 1535 STOP: 00/00/00
D. NO.: Y139 MD NO: Y139

SOURCE: AMAX PHOSPHATE FACIL STATION ID: SB-01 CASE.NO.: 15099 SAS

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RESULTS UNITS PARAMETER 1.3U MG/KG CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

SAS NO.:

STATION ID: MW-06

CASE .NO.: 15099

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SAMPLE NO. 51682 SAMPLE TYPE: GROUNDWA PROJECT NO. 91-025 PROG ELEM: NSF COLLECTED BY: M GORDON ** SOURCE: AMAX PHOSPHATE FACIL **

CITY: PALMETTO ST: FL COLLECTION START: 10/16/90 1615 STOP: 00/00/00 D. NO.: Y143

RESULTS UNITS PARAMETER 10U UG/L CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

SPECIFIED ANALYSIS DATA REPORT PROJECT NO. 91-025 SAMPLE SOURCE: AMAX PHOSPHATE FACIL STATION ID: TW-01 SAMPLE NO. 51683 SAMPLE TYPE: GROUNDWA PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL
COLLECTION START: 10/16/90 1625 STOP: 00/00/00
D. NO.: Y142 MD NO: Y142 ** ** ** ** ** CASE.NO.: 15099 SAS NO.: ** **

> RESULTS UNITS PARAMETER 100 UG/L CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

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PROJECT NO. 91-025 SAMPLE NO. 51684 SAMPLE TYPE: GROUNDWA ** **

SOURCE: AMAX PHOSPHATE FACIL STATION ID: PW-01

PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 0935 STOP: 00/00/00 D. NO: Y147 MD NO: Y147 CASE .NO .: 15099 SAS NO.:

> RESULTS UNITS PARAMETER 100 UG/L CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

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SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD, ATHENS, GA.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

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RESULTS UNITS PARAMETER 1.1U MG/KG CYANIDE

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD, ATHENS, GA.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT

SAMPLE NO. 51686 SAMPLE TYPE: SOIL PROJECT NO. 91-025

SAS NO.:

PROG ELEM: NSF COLLECTED BY: M GORDON

SOURCE: AMAX PHOSPHATE FACIL STATION ID: SB-02 ** ** CASE.NO.: 15099 **

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CITY: PALMETTO ST: FL
COLLECTION START: 10/17/90 0945 STOP: 00/00/00
D. NO.: Y145 MD NO: Y145

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> RESULTS UNITS PARAMETER 1.20 MG/KG CYANIDE

FOOTNOTES

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD, ATHENS, GA.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT PROJECT NO. 91-025 SAMPLE SOURCE: AMAX PHOSPHATE FACIL STATION ID: MW-03 SAMPLE NO. 51687 SAMPLE TYPE: GROUNDWA

SAS NO.:

PROG ELEM: NSF COLLECTED BY: M GORDON

CITY: PALMETTO ST: FL
COLLECTION START: 10/17/90 0900 STOP: 00/00/00
D. NO.: Y328 MD NO: Y328

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> RESULTS UNITS PARAMETER 10UJ UG/L CYANIDE

REMARKS HOLDING TIME EXCEEDED-CN ***REMARKS***

FOOTNOTES

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CASE.NO.: 15099

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD, ATHENS, GA.

12/04/90

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SPECIFIED ANALYSIS DATA REPORT PROJECT NO. 91-025 SAMPLE NO. 51688 SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON ** ** SOURCE: AMAX PHOSPHATE FACIL STATION ID: SD-10 CITY: PALMETTO CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1045 STOP: 00/00/00 D. NO.: Y150 MD NO: Y150 ** ** ** ** CASE . NO . : 15099 SAS NO.: ** ** ** * *

> RESULTS UNITS PARAMETER 1.8U MG/KG CYANIDE

FOOTNOTES

*A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN

*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD. ATHENS. GA.

12/04/90

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PROJECT NO. 91-025 SAMPLE NO. 51689 SAMPLE TYPE: SOIL SOURCE: AMAX PHOSPHATE FACIL STATION ID: \$5-03 PROG ELEM: NSF COLLECTED BY: M GORDON ** CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1020 STOP: 00/00/00 D. NO.: Y148 MD NO: Y148 ** ** ** ** CASE NO .: 15099 SAS NO.: ** **

RESULTS UNITS PARAMETER 1.2U MG/KG CYANIDE

FOOTNOTES

SPECIFIED ANALYSIS DATA REPORT

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^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL *K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN *U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

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SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD. ATHENS. GA.

12/04/90

SPECIFIED ANALYSIS DATA REPORT

SAS NO.:

STATION ID: TW-02 CASE.NO.: 15099

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PROJECT NO. 91-025 SAMPLE NO. 51690 SAMPLE TYPE: GROUNDWA SOURCE: AMAX PHOSPHATE FACIL PROG ELEM: NSF COLLECTED BY: M GORDON

CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1040 STOP: 00/00/00 D. NO.: Y146 MD NO: Y146

RESULTS UNITS PARAMETER 10U UG/L CYANIDE

FOOTNOTES *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN
*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

SISB/SAS DEC 1: 1990 GENTILIDIA EPA-REGION IV ATLANTA GA

UNITED STATES ENVIRONMENTAL PROTECTION AGENCE Region IV

Environmental Services Division College Station Road, Athens, Ga. 30613

*****MEMORANDUM*****

DATE: 12/05/90

SUBJECT: Results of Metals Analysis;

91-025 AMAX PHOSPHATE FACIL

PALMETTO FL CASE NO: 15099

FROM: Robert W. Knight

Chief, Laboratory Evaluation/Quality Assurance Section

TO: PHIL BLACKWELL

Attached are the results of analysis of samples collected as part of the subject project.

As a result of the Quality Assurance Review, certain data qualifiers may have been placed on the data. Attached is a DATA QUALIFIER REPORT which explains the reasons that these qualifiers were required.

If you have any questions please contact me.

ATTACHMENT

 $\mathcal{C}_{\mathcal{O}}$:

INORGANIC DATA QUALIFIERS REPORT

Case Number: 15099
Project Number: 91-025
Site: Amax Phosphate Facil., Palmetto, FL

Element	Flag	Samples_Affected	Reason
A. Water As, Cd, Pb, Se, V	U	All positives > IDL but < CRDL	Baseline instability
Al, Ba, Ca, Cu, Fe, Mg, Mn, K, Na, Zn	U	All positives > IDL but < 10x contaminant level	Positives in Blanks
нд	J	All positives	Matrix spike recovery ≈ 154%
Ag	J	A11	Matrix spike recovery = 71.3%
Tl	J R	All positives All negatives	Matrix spike recovery = 12.1%
Fe	J	A11	Serial dilution percent difference = 17.8%
Нg	J	MDY325	Technical holding time exceeded
CN	J	MDY326-329	Technical holding time exceeded
Zn	J	All positives	Blind spike recovery = 180%
As	J	MDY327-329	Calibration curve $r < .995$
Se	J	SDG MDY137, and MDY327-329	Calibration curve $r < .995$
B. Soils As, Cd, Pb, Se,	U	All positives > IDL but < CRDL	Baseline instability
Al, Ba, Ca, Cu, Fe, Mg, Mn, K, Na, Zn	U	All positives > IDL but < 10x contaminant level	Positives in Blanks
As	J R	All positives All negatives	Matrix spike recovery = 0%
Se	J R	All positives All negatives	Matrix spike recovery = 0%
Ag	J	A11	Matrix spike recovery = 74.1%
T1	J	MDY162	Duplicate MSA r <.995
Cu	J	All	Matrix duplicate RPD ≈ 105.2%
Fe	J	A11	Matrix duplicate RPD 🖚 42.6%
Pb	J	A11	Matrix duplicate RPD = 47.4%
Zn	J	All positives	Blind spike recovery = 180%

SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD, ATHENS, GA.

12/04/90

** SOURC ** STAT]	* * * * * * * * * * * * * * * * * * *	HATE FACIL	* * * * * NO. 51642		* * * * * GROUNDWA	CITY:	* * * * * * ELEM: NSF PALMETTO CTION START:		BY: M GORDON ST: FL 0630 STOP	: 00/00/00	* * * * ***
	NUMBER: 15099		SAS NUMBER:	:		MD N	UMBER: Y325				**
24U 2U 2U 1U 3U 50U 6U 4U 3U 140UJ 4U	* * * * * * * ALUMINUM ANTIMONY ARSENIC BARIUM BERYLLIUM CADMIUM CALCIUM CHROMIUM COBALT COPPER IRON LEAD MAGNESIUM	* * * * * ANALYTICA	* * * * * L RESULTS	* * * * * * *		* * * * * UG/L 2U 0.20UJ 6U 72U 2UJ 5UJ 5UJ 2UR NA 3U 60U	MANGANESE MERCURY NICKEL POTASSIUM SELENIUM SILVER SODIUM THALLIUM TIN VANADIUM ZINC	* * * * * ANALYTICA	* * * * * * * * * * * * * * * * * * *	* * * * *	**

REMARKS RECOMMENDED HOLDING TIME EXCEEDED-HG ***REMARKS***

FOOTNOTES

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN

*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

METALS DA	ATA REPORT			EPA-KI	EGIUN IV	ESU, AIHE	INS, GA.		12/04/,90
*** * * *		* * * * * *	* * * * * *		* * * *		* * * * * * * *		* * * * * * * * * * ***
** PROJ	JECT NO. 91-0	25 SAMPLE	NO. 51643 S	AMPLE TYPE:	SOIL			LECTED BY: M_GORDON	
** SOUR ** STAT	RČE: AMAX PHO: TION ID: SD-O!	SPHATE FACIL				CITY:	PALMETTO CTION START: 10	ST: FL /15/90 1655 STOP	** ** 00/00/00 **
** CASE	NUMBER: 150	99	SAS NUMBER:			MD	UMBER: Y168	/15/90 1655 STOF	7: 00/00/00 ** **
**	. HOMBEN. 100		SAS NOMBEN.			WID I	IOMOLIN. TIOO		**
*** * * *	* * * * * *	* * * * * *	* * * * * *	* * * * * *	* * * *	* * * * *	* * * * * * * * *	* * * * * * * * * *	
MG/KG 1300	ALUMINUM	ANALYTICA	L RESULIS			MG/KG 20U	MANGANESE AN	ALYTICAL RESULTS	
6 911	ANTIMONY					0.14U	MERCURY		
6.90 20J 7.5	ARSENIC					1.70	NICKEL		
7.5	BARIUM					280U 0.57UR	POTASSIUM		
0.290	BERYLLIUM CADMIUM					0.57UR 1.4UJ	SELENIUM SILVER		
3100	CALCIUM					2900	SODIUM		
0.29U 0.86U 3100 2.8	CHROMIUM					0.570	THALLIUM		
1.10	COBALT					NA NA	TIN		
20UJ 1600J	COPPER IRON					3U 20UJ	VANADIUM ZINC		
74J	LEAD					2003 31	PERCENT MOISTU	RF	
1100	MÄGNESIUM					•			

^{***}FOOTNOTES***

^{*}COUNCIES***

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SAMPLE	AND	ANAL	YSIS	MANAGEME	NT SYSTEM
ED	A_DE	HOLE	TUE	IN ATUEN	C CA

12/04/90 EPATREGIUN IV ESD. AIMENS, GA. **METALS DATA REPORT** **

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PROJECT NO. 91-025 SAMPLE NO. 51644 SAMPLE TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON SOURCE: AMAX PHOSPHATE FACIL ST: FL **

CITY: PALMETTO ST: M GURDON ST: FL COLLECTION START: 10/17/90 1645 STOP: 00/00/00 MD NUMBER: Y169 STATION ID: SW-05 CASE NUMBER: 15099 ** SAS NUMBER: ** **

UG/L **ANALYTICAL RESULTS** UG/L ANALYTICAL RESULTS

800 ALUMINUM 500° MANGANESE 24U 5U 29 ANTIMONY 0.200 MERCURY ARSENIC 6U NICKEL BARIUM 68000 **POTASSIUM** BERYLLIUM 20J SELENIUM ЭŪ CADMIUM SILVER 5UJ 160000 CALCIUM 1500000 SODIUM CHROMIUM 10UR 6U THALLIUM 4Ŭ COBALT NA TIN VANADIUM COPPER 4U ЗU 240UJ IRON **40UJ** ZINC

30 LEAD 220000 MAGNESIUM

FOOTNOTES *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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METALS DATA REPORT			, - ,
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** PROJECT NO. 91-025 SAMPLE NO. 51645 SAMPLE		M: NSF COLLECTED BY: M_GORDON	**
** SOURCE: AMAX PHOSPHATE FACIL ** STATION ID: SD-04	CITY: PAI	LMETTO ST: FL	**)/00/00 **
** STATION ID: SD-04 ** CASE NUMBER: 15099 SAS NUMBER:	MD NIIMRI	ON START: 10/17/90 1630 STOP: OC ER: Y166	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
** ORSE 1401110E111. 15050 SAS 1401115E111.	IND (40IIID)	LK. 1700	**
*** * * * * * * * * * * * * * * * * * *			* * * * * * * * ***
MG/KG ANALYTICAL RESULTS	MG/KG	ANALYTICAL RESULTS	
530 ALUMINUM 5.60 ANTIMONY		NGANESE RCURY	
1UJ ARSENIC		CKEL	
19 BARIUM	30U PO	TASSIUM	
O.23U BERYLLIUM		LENIUM	
Ö.70U CADMIUM 2000 CALCIUM		LVER	
2000 CALCIUM 1.4U CHROMIUM		DIUM ALLIUM	
1.4U CHROMIUM 0.93U COBALT	NA TI		
3UJ COPPER	1U VAI	NADIUM	
830J IRON	9UJ ZI!		
1.1J LEAD 82 MAGNESIUM	20 PEI	RCENT MOISTURE	
OZ MAGNESION			

^{***}FOOTNOTES***

^{*}TOOTHOUS***
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SAMPLE	AND	ANAL	YSIS	MAI	NAGEMENT	SYSTEM
FD/	\−RF(MOTE	IV F	SD	ATHENS	GΔ

12/04/90 **METALS DATA REPORT** * * * * * * * * * * * PROJECT NO. 91-025 SAMPLE NO. 51646 SAMPLE TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON SOURCE: AMAX PHOSPHATE FACIL ST: FL COLLECTION START: 10/17/90 1620 STOP: 00/00/00 MD NUMBER: Y167 ** STATION ID: SW-04 CASE NUMBER: 15099 ** ** SAS NUMBER: ** ** ** ** UG/L **ANALYTICAL RESULTS** UG/L ANALYTICAL RESULTS 40U **ALUMINUM** 20U MANGANESE 240 30 200 10 ANTIMONY 0.200 MERCURY ARSENIC 6U NICKEL POTASSIUM SELENIUM BARIUM 16000 BERYLLIUM 10UJ CADMIUM 50J SILVER 160000 CALCIUM 110000 SODIUM CHROMIUM **6**U **10UR** THALLIUM 40 COBALT TIN COPPER 5Ú VANADIUM 170UJ IRON 50UJ ZINC

30

58000

LEAD

MAGNESIUM

^{***}FOOTNOTES***

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METALS DATA REPORT	EFA REGION IV ESD, ATRIENS, GA.	12/04/\$0
*** * * * * * * * * * * * * * * * * * *	TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON ST: FL COLLECTION START: 10/17/90 1605 STOP MD NUMBER: Y165	* * * * * * * * * * * * * * * * * * *
UG/L 140U ALUMINUM 24U ANTIMONY 3U ARSENIC 20U BARIUM 1U BERYLLIUM 3U CADMIUM 160000 CALCIUM 6U CHROMIUM 4U COBALT 3U COPPER 350UJ IRON 4U LEAD 42000 MAGNESIUM	# * * * * * * * * * * * * * * * * * * *	

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^{***}FOOTNOTES***

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METALS DATA REPORT		
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** PROJECT NO. 91-025 SAMPLE NO. 51648 SAMPLE		**
** SOURCE: AMAX PHOSPHATE FACIL ** STATION ID: SD-08	CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1610 STOP:	00/00/00 **
** CASE NUMBER: 15099 SAS NUMBER:	COLLECTION START: 10/17/90 1610 STOP:	00/00/00
**	MD NOMBER. 170-7	**
		* * * * * * * * * * * * * * * * * * * *
MG/KG ANALYTICAL RESULTS	MG/KG ANALYTICAL RESULTS	
950 ALUMINUM 7U ANTIMONY 2UJ ARSENIC	20U MANGANESE 0.14U MERCURY	
2UJ ARSENIC	2U NICKEL	
13 BARIUM	2U NĪCKEL 50U POTASSIUM	
O.29U BERYLLIUM	O.59UR SELENIUM	
O.87U CADMIUM	1.4UJ SILVER	
7200 CALCIUM 6.6 CHROMIUM	160U SODIUM	
6.6 CHROMIUM 1.2U COBALT	O.59U THALLIUM NA TIN	
20UJ COPPER	4U VANADIUM	
2100J IRON	40UJ ZINC	
15J LEAD	33 PERCENT MOISTURE	
520 MÄGNESIUM		

^{***}FOOTNOTES***

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METALS DATA REPORT	EFA KEGION IV	LSD, ATTILIAS, GA.	12/04/90
*** * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * *	PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1505 STOP MD NUMBER: Y159	* * * * * * * * * * * * * * * * * * *
*** * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * *	MG/KG ANALYTICAL RESULTS 44 MANGANESE 0.18U MERCURY 17 NICKEL 290U POTASSIUM 0.82UR SELENIUM 1.9UJ SILVER 2800 SODIUM 0.82U THALLIUM NA TIN 5U VANADIUM 20UJ ZINC 51 PERCENT MOISTURE	* * * * * * * * * * * *

^{***}FOOTNOTES***

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METALS DATA REPORT	Et // NEGEOIA E	v 200, miletto, am	12,01,00
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	NO. 51650 SAMPLE TYPE: SURFACE	EWA PROG ELEM: NSF COLLECTED BY: M GOR CITY: PALMETTO ST: FL	DON **
** SOURCE: AMAX PHOSPHATE FACIL ** STATION ID: SW-11			TOP: 00/00/00 **
** CASE NUMBER: 15099	SAS NUMBER:	MD NUMBER: Y158	**
**			**
UG/L ANALYTICA	* * * * * * * * * * * * * * * * * * *	UG/L ANALYTICAL RESULTS	* * * * * * * * * * * * * * * * * * * *
30U ALUMINUM	E NESVETS	8U MANGANESE	
3OU ALUMINUM 24U ANTIMONY 49 ARSENIC 9U BARIUM 1U BERYLLIUM 3U CADMIUM		O.20U MERCURY	
49 ARSENIC 9U BARIUM		11U NICKEL 89000 POTASSIUM	
1U BERYLLIUM		10UJ SELENIUM	
3U CADMIUM		5UJ SILVER	
1/0000 CALCIUM		650000 SODIUM 10UR THALLIUM	
4U COBALT		NA TIN	
3U COPPER		3U VANADIUM	
60UJ IRON		40UJ ZINC	
3U LEAD 49000 MAGNESIUM			

^{***}FOOTNOTES*** *FOUNDIES***
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METALS DATA	A REPORT				E	-d10/4 14	LJO, AIII	LNO, UA.				12/04/00
*** * * * * ** PROJECT ** SOURCET ** STATIC	* * * * * * * CT NO. 91-025 E: AMAX PHOSPH ON ID: SW-09 NUMBER: 15099		* * * * D. 51651 S NUMBER:			* * * * SURFACEW	A PROG CITY COLL		COLLECTED	BY: M GORDON ST: FL 1515 STOP:	: 00/00/00	* * * * ** ** ** **
500 A 300J A 63 E 23 130 670000 0 360 210 0 200 200 2		* * * * * * * * * * * * * * * * * * *		• • • •	* * *		* * * * * UG/L 4100 0.20U 690 160000 20UJ 5UJ 12000000 13J NA 820 1400J	MANGANESE MERCURY NICKEL POTASSIUM SELENIUM SILVER SODIUM THALLIUM TIN VANADIUM ZINC	* * * * * * * ANALYTICA	* * * * * * * * L RESULTS	* * * * *	* * * * ***

^{***}FOOTNOTES***

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METALS D/	ATA REPORT		•
*** * * *			* * * * * * * * * * * * * * * * * * * *
	JECT NO. 91-025 SAMPLE NO	51652 SAMPLE TYPE: SOIL	PROG ELEM: NSF. COLLECTED BY: M GORDON **
	RCE: AMAX PHOSPHATE FACIL		CITY: PALMETTO ST: FL **
	TION ID: SD-09	MIMOED	COLLECTION START: 10/17/90 1530 STOP: 00/00/00 **
	E NUMBER: 15099 SAS	NUMBER:	MD NUMBER: Y162
**			
MG/K	ANALYTICAL R		MG/KG ANALYTICAL RESULTS
21000	ALUMINUM	.30213	26 MANGANESE
20Ŭ	ANTIMONY		O. 17U MERCURY
2.1UR	ARSENIC		4U NICKEL
<u>1</u> 10	BARIUM		2000 POTASSIUM
20	BERYLLIUM		Q.86UR ŞELENIUM
2.6	CADMIUM		2.1UJ SILVER
200000	CALCIUM CHROMIUM		12000 SODIUM 4UJ THALLIUM
140 2.7	COBALT		4UJ THALLIUM NA TIN
โ๋งบ์ป	COPPER		140 VANADIUM
45000J	IRON		70UJ ZINC
85J	LEAD		54 PERCENT MOISTURE
2000	MAGNESIUM		

^{***}FOOTNOTES***

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METALS DATA REPORT		, ., .,
*** * * * * * * * * * * * * * * * * * *		
		BY: M_GORDON **
** SOURCE: AMAX PHOSPHATE FACIL ** STATION ID: SD-07	CITY: PALMETTO	ST: FL ** 1520 STOP: 00/00/00 **
** CASE NUMBER: 15099 SAS NUMBER	COLLECTION START: 10/17/90: MD NUMBER: Y160	1520 510P: 00/00/00 **
**	. IND HOMBER. 1100	**
*** * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * * *	
MG/KG ANALYTICAL RESULTS	MG/KG ANALYTICA 22 MANGANESE	AL RESULTS
6.2U ANTIMONY	0.12U MERCURY	
2UJ ARSENIC	2.7 NICKEL	
13 BARTUM	50U POTASSIUM	
O.26U BERYLLIUM O.78U CADMIUM	O.52UR SELENIUM 1.3UJ SILVER	
27000 CALCIUM	140U SODIUM	
6.1 CHROMIUM	0.52U THALLIUM	
1U COBALT 8UJ COPPER	NA TIN SU VANADIUM	
6400J IRON	5U VANADIUM 30UJ ZINC	
11J LEAD	26 PERCENT MOISTURE	
200 MAGNESIUM		

^{***}FOOTNOTES***

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METALS DATA REPORT	EPA-REGION IV ESU, ATHENS, GA.	12/04/90
*** * * * * * * * * * * * * * * * * * *	TYPE: SURFACEWA PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1515 STOP MD NUMBER: Y161	* * * * * * * * * * * * * * * * * * *
UG/L ALUMINUM 24U ANTIMONY 2U ARSENIC 2OU BARIUM 1U BERYLLIUM 3U CADMIUM 180000 CALCIUM 6U CHROMIUM 4U COBALT 3U COPPER 200UJ IRON 3U LEAD 59000 MAGNESIUM	UG/L 40U MANGANESE O.20U MERCURY 6U NICKEL 5300 POTASSIUM 10UJ SELENIUM 5UJ SILVER 100000 SODIUM 10UR THALLIUM NA TIN 3U VANADIUM 40UJ ZINC	

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^{***}FOOTNOTES***

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SAMPLE	AND	ANAL	YSIS	MAN	AGEMENT	SYSTEM	
FD/	1-RF	CON	TV F	SD	ATHENS	GΔ	

12/04/90 METALS DATA REPORT

*** * * * ** PROJ ** SOUF ** STAT	# # # # # # # # # # # # # # # # # # #	HATE FACIL	NO. 51655 SAS NUMBER:	SAMPLE TYPE	* * * * * : SOIL	CITY:	* * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * *
*** * * * * * * * * * * * * * * * * *	ALUMINUM ANTIMONY ARSENIC BARIUM BERYLLIUM CADMIUM CALCIUM CHROMIUM COBALT COPPER IRON LEAD MAGNESIUM	* * * * * * ANALYTICAL	* * * * * RESULTS	* * * * * *	* * * * *	* * * * * * MG/KG 26 0.11U 2.3 40U 0.48UR 1.2UJ 140U 0.48U NA 3U 9UJ 21		ALYTICAL RESULTS	* * * * * * * * * * * * * * * * * * * *

^{***}FOOTNOTES***

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METALS D	ATA REPORT			_	. A MEGICIE I	COD, ATTIC	ito, un.		12,04,00
*** * * * * * * * * * * * * * * * * *	JECT NO. 91-025 RCE: AMAX PHOSP TION ID: SW-06 E NUMBER: 15099	HATE FACIL	NO. 51656 SAS NUMBER:		YPE: SURFACE	CITY: COLLE	ELEM: NSF PALMETTO CTION START: UMBER: Y157	COLLECTED BY: M GORDON ST: FL 10/17/90 1440 STOP	: 00/00/00
*** * * * * * * * * * * * * * * * * *	* * * * * * * * * ALUMINUM ANTIMONY ARSENIC BARIUM BERYLLIUM CADMIUM CALCIUM CHROMIUM COBALT COPPER IRON LEAD MAGNESIUM	* * * * * * ANALYTICA		* * * *	· * * * * *	* * * * * * * * * * * * * * * * * * *	MANGANESE MERCURY NICKEL POTASSIUM SELENIUM SILVER SODIUM THALLIUM TIN VANADIUM ZINC	* * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * * *

^{***}FOOTNOTES***

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN

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METALS	ATA REPORT											, ., .,	
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** PRO	JECT NO. 91-025		NO. 51661	SAMPLE	TYPE:	SOIL	PROG	ELEM: NSF	COLLECTED	BY: M_GORDON		**	
	RCE: AMAX PHOSI	PHATE FACIL					CITY	PALMETTO	40 /40 /00	ST: FL	00 (00 (00	**	
	TION ID: SB-04		AC MIMPED	_			COLLE	CTION START	: 10/18/90	1030 STOP	: 00/00/00	**	
** CAS	E NUMBER: 15099	9	SAS NUMBER	•			MUN	NUMBER: Y174				**	
*** * *				* * * *	* * *	* * * *						* * * * ***	
MG/K	.G	ANALYTICAL	RESULTS				MG/KG		ANALYTICA	L RESULTS			
1100	ALUMINUM						30	MANGANESE					
7.4U	ANTIMONY						0.110	MERCURY					
2ŬĴ 5.3	ARSENIC						1.50	NICKEL					
5.3 0.250	BARĪUM BERYLLIUM						33U 0.73UR	POTASSIUM SELENIUM					
0.74U	CADMIUM						1.2UJ	SILVER					
600	CALCIUM						600	SODIUM					
ŽŬ	CHROMIUM						0.49U	THALLIUM					
1.70	COBALT						NA	TIN					
<u> </u>	COPPER						2 U .	VANADIUM					
460	IRON						4UJ	ZINC	CTUBE				
1.4J 60U	LEAD MAGNESIUM						20	PERCENT MO	SIUKE				
000	MAGNESION												

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METALS DATA REPORT	EPA-REGION IV ESD, ATHENS, GA.	12/04/90
	CITY: PALMETTO ST: FL	* * * * * * * * * * * * * * * * * * *
UG/L 20000 ALUMINUM 24U ANTIMONY 56 ARSENIC 210 BARIUM 2U BERYLLIUM 3U CADMIUM 320000 CALCIUM 38 CHROMIUM 9 COBALT 3U COPPER 25000J IRON 12 LEAD 25000 MAGNESIUM	UG/L 39	* * * * * * * * * * ***

^{***}FOOTNOTES***

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METALS DATA REPORT		,,
*** * * * * * * * * * * * * * * * * * *	TYPE: SOIL PROG ELEM: NSF COLLECTED CITY: PALMETTO COLLECTION START: 10/18/90 MD NUMBER: Y173	* * * * * * * * * * * * * * * * * * *
MG/KG ALUMINUM 7.7U ANTIMONY 2UJ ARSENIC 13 BARIUM 0.26U BERYLLIUM 0.77U CADMIUM 9200 CALCIUM 3U CHROMIUM 1.8U COBALT 5UJ COPPER 2600J IRON 8.9U LEAD 260 MAGNESIUM	MG/KG ANALYTICAL ### ANALYTIC	* * * * * * * * * * * * * * * * * * *

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METALS DATA REPORT	LEATREGION IN LOD, ATTIEND, GA.	12/04/90
*** * * * * * * * * * * * * * * * * * *	TYPE: GROUNDWA PROG ELEM: NSF COLLECTIV: PALMETTO COLLECTION START: 10/1 MD NUMBER: Y172	ECTED BY: M GORDON ** ST: FL ** 18/90 0930 STOP: 00/00/00 ** **
UG/L ANALYTICAL RESULTS 5600 ALUMINUM 24U ANTIMONY 3U ARSENIC 130 BARIUM 1U BERYLLIUM 3U CADMIUM 470000 CALCIUM 13 CHROMIUM 4U COBALT 6U COPPER 2300J IRON 5 LEAD 39000 MAGNESIUM		* * * * * * * * * * * * * * * * * * *

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METALS DA	ATA REPORT	·
*** * * *		
	JECT NO. 91-025 SAMPLE NO. 51665 SAMPLE TYPE: SOIL	PROG ELEM: NSF COLLECTED BY: M GORDON **
	RCE: AMAX PHOSPHATE FACIL	CITY: PALMETTO ST: FL **
** STAT	TION ID: SB-05	COLLECTION START: 10/18/90 0910 STOP: 00/00/00 ** MD NUMBER: V171 **
** CASE	NUMBER: 15099 SAS NUMBER:	MD NUMBER: Y171 **
*** * * *		
MG/KG	ANALYTICAL RESULTS	MG/KG ANALYTICAL RESULTS
1700	ALUMINUM	5U MANGANESE
7.2U	ANTIMONY	O. 10U MERCURY
20J 5.6	ARSENIC	1.4U NICKEL
5.6	BARIUM BERYLLIUM	70U POTASSIUM O.71UR SELENIUM
0.24U 0.72U	CADMIUM	1.2UJ SILVER
6700	CALCIUM	160U SODIUM
4.1	CHROMIUM	O.47U THALLTUM
1.70	COBALT	NA TIN
6ีกา	COPPER	<u>9U YANADIUM</u>
700J	IRON	5UJ ZINC
1.3J	LEAD	18 PERCENT MOISTURE
1900	MAGNESIUM	

^{***}FOOTNOTES*** *FOOTNOTES***

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*** * * ** PR	DATA REPORT * * * * * * * OJECT NO. 91-02 URCE: AMAX PHOS		* * * * * NO. 51666	* * * * * * SAMPLE TYPE	* * * * * : SOIL	CITY:	PALMETTO	LECTED BY: M GORDON ST: FL	* * * * * *	* * * ***
** CA **	ATION ID: SS-05 SE NUMBER: 1509	9	SAS NUMBER:			COLLE MD N	CTION START: 10, UMBER: Y170	/18/90 0900 STOP	: 00/00/00	** ** **
*** * * MG/ 6000 6.5U 2.3UR 55 1U 4.4 190000 29 2.4 5UJ 4300J 19J 1100	* * * * * * * * * * * * * * * * * * *	* * * * * * * * ANALYTICA	* * * * * * * * * * * * * * * * * * *	* * * * * *		* * * * * * * * * 95 95 0.11U 9 860 3.4UR 1.1UJ 2600 1U NA 56 50UJ 14	MANGANESE MERCURY NICKEL POTASSIUM SELENIUM SILVER SODIUM THALLIUM TIN VANADIUM ZINC PERCENT MOISTUR	ALYTICAL RESULTS	* * * * * *	* * * ***

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METALS DA	TA REPORT				E1 15 15		11 200	,	ileito, GA.						, 0	.,
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** PROJ	ECT NO. 91-025	SAMPLE N	NO. 51667	SAMPLE	TVPF .	SOTI		PRO	G ELEM: NS	F COLLECT	TED BY	M GORDON				**
** SOUR	CE: AMAX PHOSPI	HATE FACTI	. 51007			3012		CITY	Y: PALMETT	ָרָ טְּטָבָרָנָייִי	'τυ υς τ	FL				**
** STAT	ION ID: SS-07							COL	FCTION ST	ĂRT: 10/17/	/90 ĭiŝ	เก่รรากค	00/00	/00		**
** CASE	NUMBER: 15099	SA	S NUMBER					MD.	NUMBER: Y	153	, , , , , ,	3.0.	. 00,00,	00		**
**	140MBER: 13033	Jr	- HOMBEN					mb	HOMBETT. 1	150						**
*** * * *													:			
MG/KG		ANALYTICAL	RESIII TS				, , ,	IG/KG		ΔΝΔΙ Υ	TICAL RE					
1100	ALUMINUM	MINETTEONE	KESUZIS				25"	ia, ita	MANGANES		I TOAL IL	.50215				
5.40 30J 30 10	ANTIMONY						0.1	OII	MERCURY	J.						
311.1	ARSENIC						3 .9		NICKEL							
30	BARIUM						240	M	POTASSI	IM.						
111	BERYLLIUM						2.3	IIR	SELENIU							
iŭ	CADMIUM						1.1	ĭi.i	SILVER	**						
150000	CALCIUM						960		SODIÚM							
11	CHROMIUM						0.4		THALLIU	M						
၁ ii	COBALT						• • • • • • • • • • • • • • • • • • • •	N/		•••						
2บ 2บป	COPPER						13	147	VĀNADIU	и						
1800J	IRON						200	.i	ZINC	**						
8.9J	LEAD						16	•		MOISTURE						
190	MAGNESIUM						,,		. 2.102141							

^{***}FOOTNOTES*** *TOUTNUTES***

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METALS DATA REPORT	ETA NEGICIA IV ESS, ATTENS, GA.	12,04,00
*** * * * * * * * * * * * * * * * * * *	TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1205 STOP: MD NUMBER: Y152	00/00/00
### # # # # # # # # # # # # # # # # #	MG/KG ANALYTICAL RESULTS 14 MANGANESE 0.10U MERCURY 3.5 NICKEL 820 POTASSIUM 2.4UR SELENIUM 1.2UJ SILVER 2900 SODIUM 0.48U THALLIUM NA TIN 42 VANADIUM 20UJ ZINC 21 PERCENT MOISTURE	* * * * * * * * * * ***

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METALS DATA REPORT *** * * * * * * * * * * * * * * * * *	
** SOURCE: AMAX PHOSPHATE FACIL ** STATION ID: SD-12 ** CASE NUMBER: 15099 SAS NUMBER: ** CASE NUMBER: Y154 **	* * * *
** SOURCE: AMAX PHOSPHATE FACIL CITY: PALMETTO ST: FL ** STATION ID: SD-12 COLLECTION START: 10/17/90 1230 STOP: 00/00/00 ** CASE NUMBER: 15099 SAS NUMBER: MD NUMBER: Y154 **	**
** STATION ID: SD-12 COLLECTION START: 10/17/90 1230 STOP: 00/00/00 ** CASE NUMBER: 15099 SAS NUMBER: MD NUMBER: Y154 **	**
** CASE NUMBER: 15099 SAS NUMBER: MD NUMBER: Y154 **	**
**	**
	**
	* * * *
MG/KG ANALYTICAL RESULTS MG/KG ANALYTICAL RESULTS	
12000 ALUMINUM 40 MANGANESE	
6.9U ANTIMONY 0.14U MERCURY	
1.5UR ARSENIC 7.6 NICKEL	
64 BARIUM 1600 POTASSIUM	
2U BERYLLIUM 3.1UR SELENIUM	
8 CADMIUM 1.4UJ SILVER	
110000 CALCIUM_ 6700 SODIUM	
76 CHROMIUM 0.61U THALLIUM	
3.4 COBALT NA TIN	
8UJCOPPER 13O VANADIUM	
1800OJ IRON 70UJ ZINC	
59J LEAD 36 PERCENT MOISTURE	
9900 MAGNESIUM	

^{***}FOOTNOTES***

METALS DATA REPORT	El A Heddon IV Ebb, Allieb, GA.	12/04/00
** PROJECT NO. 91-025 SAMPLE NO. 51670 ** SOURCE: AMAX PHOSPHATE FACIL ** STATION ID: SB-06 ** CASE NUMBER: 15099 SAS NUMBER:	SAMPLE TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/17/90 1215 STOP:	00/00/00
### # # # # # # # # # # # # # # # # #	* * * * * * * * * * * * * * * * * * *	* * * * * * * * * * ***

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METALS DATA R	FDORT				,,
*** * * * * * ** PROJECT ** SOURCE: ** STATION	* * * * * * * * * * * * * * * * NO. 91-025 SAMPLE AMAX PHOSPHATE FACIL ID: SB-03	* * * * * * * * * * * * * * * * * * *	CI1 COL	E * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * *
5.6U ANT 1UJ ARS 11 BAR 0.24U BER 0.71U CADI 42000 CAL 6.6 CHR 0.94U COB 0.71UJ COP 2700J IRO 1.8J LEAI	PER N	* * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * *	MANGANESE MERCURY NICKEL POTASSIUM SELENIUM	• • • • • • • • • • • • • • • • • • • •

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METALS	ATA REPORT				CPATR	EGION IA	E3U, /	AIMEN	15, GA.				12/04/90
*** * * ** PRO ** SOU ** STA	TALL TO THE PROPERTY OF THE PR	SPHATE FACIL	NO. 51672 SAS NUMBER		* * * TYPE:	* * * * GROUNDWA	C	ITY: OLLEC	LEM: NSF PALMETTO TION START:		BY: M GORDON ST: FL 1145 STOR) P: 00/00/0	* * * * * *** ** ** **
*** * * UG/L 7300 24U 18 53 1U 600000 12 4U 4U 27000J 3U 36000	ALUMINUM ANTIMONY ARSENIC BARIUM BERYLLIUM CADMIUM CALCIUM CHROMIUM COBALT COPPER IRON LEAD MAGNESIUM	* * * * * * * ANALYTICA	* * * * * * * * * * * * * * * * * * *	* * * *	* * *	* * * *	* * * * UG/I 30U 0.20U 6U 23000 10UJ 5UJ 7000 2UR 20U 50UJ	NA	MANGANESE MERCURY NICKEL POTASSIUM SELENIUM SILVER SODIUM THALLIUM TIN VANADIUM ZINC	* * * * * * * ANALYTIC	* * * * * * * * * * * * * * * * * * *	: * * * *	* * * * * * *

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SAMPLE AND ANALYSIS MANAGEMENT SYSTEM EPA-REGION IV ESD, ATHENS, GA.

12/04/90

METALS DATA REPORT		• •
*** * * * * * * * * * * * * * * * * * *	E TYPE: GROUNDWA PROG ELEM: NSF CITY: PALMETTO COLLECTION START: MD NUMBER: Y326	COLLECTED BY: M GORDON ** ST: FL ** 10/16/90 1130 STOP: 00/00/00 ** **
UG/L ANALYTICAL RESULTS 3400 ALUMINUM 30U ANTIMONY 6U ARSENIC 30U BARIUM 1U BERYLLIUM 3U CADMIUM 81000 CALCIUM 5U CHROMIUM 7U COBALT 7U COPPER 3300J IRON 5 LEAD 37000 MAGNESIUM	UG/L 73 MANGANESE 0.20U MERCURY 8U NICKEL 4000 POTASSIUM 3U SELENIUM 5UJ SILVER 75000 SODIUM 10UR THALLIUM NA TIN 9U VANADIUM 50UJ ZINC	ANALYTICAL RESULTS

REMARKS HOLDING TIME EXCEEDED-CN ***REMARKS***

FOOTNOTES *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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*** * * * ** PROJ ** SOUR ** STAT ** CASE	ATA REPORT * * * * * * * * BECT NO. 91-025 RCE: AMAX PHOSP ION ID: SW-01 : NUMBER: 15099	HATE FACIL	* * * * * NO. 51674 SAS NUMBER:	* * * * * * * * * * * * * * * * * * *	CI	* * * * * * * * * * * * * * * * * * *	COLLECTED BY: M GORDON ST: FL 10/16/90 1330 STOP	2: 00/00/00 ** ** **
** * * * * * * * * * * * * * * * * * *	ALUMINUM ANTIMONY ARSENIC BARIUM BERYLLIUM CADMIUM CHROMIUM COBALT COPPER IRON LEAD MAGNESIUM	* * * * * ANALYTICA	* * * * * L RESULTS	* * * * * *	UG/L 20U 0.20U 6U 47000 2UJ 5UJ 110000 10UR 4U 40UJ	MANGANESE MERCURY NICKEL POTASSIUM SELENIUM SILVER	* * * * * * * * * * * * * * * * * * *	**

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SAMPLE AND	ANALYSIS	MANAGEMENT	SYSTEM
FDA-DF	CTON IV F	CD ATHENC	GΛ

12/04/90

*** * * * * * * * * * * * * * * * * *	PHATE FACIL	SOIL PROG ELEM: NSF CITY: PALMETTO COLLECTION STAR MD NUMBER: Y136	**************************************
*** * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * *	MG/KG 2U MANGANESE 0.11U MERCURY 1.4U NICKEL 60U POTASSIUM 0.48UR SELENIUM 1.2UJ SILVER 350U SODIUM 0.48U THALLIUM TIN 1U VANADIUM 9UJ ZINC 22 PERCENT MC	ANALYTICAL RESULTS

METALS DATA REPORT

^{***}FOOTNOTES***

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METALS D	ATA REPORT				C1 / 1	LUION IV	LUD, AI	TICHS, GA.				12/04/30
*** * * ** PRO ** SOU ** STA	TENUMBER: 1509	PHATE FACIL				* * * * GROUNDWA	PRO CIT COL	* * * * * * * G ELEM: NSF Y: PALMETTO LECTION START NUMBER: Y329	: 10/16/90 13	T: FL	00/00/00	* * * * *** ** ** **
*** * * UG/L 1610 30U 6UJ 52 1U 3U 270000 9 7U 3U 3200J 3U 61000	* * * * * * * ALUMINUM ANTIMONY ARSENIC BARIUM BERYLLIUM CADMIUM CALCIUM CHROMIUM COBALT COPPER IRON LEAD MAGNESIUM	* * * * * * * ANALYTICA	L RESULTS	* * * *	* * *		* * * * * * * * * * * * * * * * * * *	MANGANESE MERCURY NICKEL POTASSIUM SELENIUM SILVER SODIUM THALLIUM A TIN VANADIUM ZINC	* * * * * * * * * * * * * * * * * * *	* * * * * RESULTS	• • • •	* * * * ***

REMARKS HOLDING TIME EXCEEDED-CN ***REMARKS***

^{***}FOOTNOTES*** *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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METALS DATA RE	PORT				/ 0 . / 00
*** * * * * * ** PROJECT N ** SOURCE: A ** STATION I	* * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * *	C	ROG ELEM: NSF COLLECTED BY: M GO ITY: PALMETTO ST: FL OLLECTION START: 10/16/90 1415 MD NUMBER: Y141	* * * * * * * * * * * * * * * * * * *
24U ANTI 8U ARSE 120 BARI 1U BERY 3U CADM 170000 CALC 28 CHRO 4U COBA 110U COPP 14000J IRON 14 LEAD	IINUM MONY NIC UM LLIUM IUM IUM MIUM LT ER	* * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * UG/ 110 0.20U 8U 13000 4UJ 5UJ 68000 10UR 30U 130UJ	MANGANESE MERCURY NICKEL POTASSIUM SELENIUM SILVER SODIUM THALLIUM NA TIN VANADIUM	* * * * * * * * * * * * * * * * * * * *

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N	IFTALS DA	ATA REPORT						-							-, -	•
*	** * * *	* * * * * * *	* * * * *	* * * * *	* * * *	* * * *	* * * *	* * *	* * *	* * * * *	* * * * * :			* * *	* * * *	
		ECT NO. 91-025		NO. 51678	SAMPLE	TYPE:	SOIL	PR	OG ELE		COLLECTED	BY: M_GORDO	ON			**
		RCE: AMAX PHOSP 'ION ID: SD-02	HAIE FAULL	•				CI	IY: PA	LMETTO	. 10/16/00	ST: FL	n. 00	100 100		**
		: NUMBER: 15099		SAS NUMBER				CU	D MINIME	UN START: ER: Y140	: 10/16/90	1420 ST	יטט: טען	/00/00		**
	**	. NUMBER. 13033		SAS NURIDER				141	ם איטאים	LK. 1140						**
	** * * *	* * * * * *	* * * * *	* * * * *	* * * *	* * * :		* * *	* * *	* * * * *			* * *	* * *	* * * *	
	MG/KG		ANALYTICA	L RESULTS				MG/K			ANALYTICA	AL RESULTS				
	0000	ALUMINUM						63		NGANESE						
	ดบ	ANTIMONY						Q. <u>2</u> 6U		RCURY						
5	M	ARSENIC						6.7	NI	CKEL TASSIUM						
	30).63U	BARIUM BERYLLIUM						270U 1.2UR		LENIUM						
1	.90	CADMIUM						3. 2UJ		LVER						
ġ	eooo	CALCIUM						2900		DĬŪM						
2	20	CHROMIUM						1.20		ALLIUM						
3	U	COBALT							NA TI							
	2J	COPPER						200		NADIUM						
	1000J	IRON					•	70UJ		NC						
1	6J 2500	LEAD MAGNESIUM						69	PE	RCENT MOI	ISTURE					
- 2	300	MAGNESIUM														

^{***}FOOTNOTES***

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METALS DATA REPORT
PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL
   PROJECT NO. 91-025 SAMPLE NO. 51679 SAMPLE TYPE: GROUNDWA
                                                                                                 **
   SOURCE: AMAX PHOSPHATE FACIL
**
                                                                                                 **
                                                     COLLECTION START: 10/16/90 1520 STOP: 00/00/00
   STATION ID: MW-04
                                                                                                 **
**
   CASE NUMBER: 15099
                         SAS NUMBER:
                                                     MD NUMBER: Y327
**
                                                                                                 **
**
                                                                                                 **
  UG/L
                  ANALYTICAL RESULTS
                                                   UG/L
                                                                  ANALYTICAL RESULTS
440U
       ALUMINUM
                                                  8U 
                                                         MANGANESE
300
       ANTIMONY
                                                  0.200
                                                         MERCURY
300
300
10
                                                         NICKEL
       ARSENIC
BARIUM
                                                  6U
                                                         POTASSIUM
                                                  2600
                                                         SELENIUM
       BERYLLIUM
                                                  300
       CADMIUM
ЗŪ
                                                  50J
                                                         SILVER
140000
       CALCIUM
                                                  36000
                                                         SODIUM
50
70
       CHROMIUM
                                                  2UR
                                                         THALLIUM
                                                      NA
       COBALT
                                                         TIN
                                                         VÄNADIUM
5Ŭ
       COPPER
                                                  4U
1300J
       IRON
                                                  50UJ
                                                         ZINC
30
       LEAD
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REMARKS HOLDING TIME EXCEEDED-CN

16000

MAGNESIUM

REMARKS

FOOTNOTES *A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
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METALS DATA REPORT	ETA REGION IV ESS, ATTENO, GA.	12,0-1,00
*** * * * * * * * * * * * * * * * * * *	TYPE: SOIL PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL COLLECTION START: 10/16/90 1520 STOP: MD NUMBER: Y138	00/00/00
MG/KG 1600 ALUMINUM 6.6U ANTIMONY 2UJ ARSENIC 11 BARIUM 0.28U BERYLLIUM 0.83U CADMIUM 45000 CALCIUM 4.9 CHROMIUM 1.1U COBALT 8UJ COPPER 1500J IRON 7.1J LEAD 4500 MAGNESIUM	MG/KG ANALYTICAL RESULTS 24 MANGANESE O.12U MERCURY 1.7U NICKEL 160U POTASSIUM O.55UR SELENIUM 1.4UJ SILVER 280U SODIUM O.55U THALLIUM NA TIN 5U VANADIUM 30UJ ZINC 30 PERCENT MOISTURE	* * * * * * * * * * * * * * * * * * *

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METALS DA	TA REDORT						•					•
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	ECT NO. 91-025		NO. 51681	SAMPLE	TYPE: SO:	IL			COLLECTED	BY: M_GORDON		**
	CE: AMAX PHOSP	HATE FACIL						PALMETTO	40 (40 (00	ST: FL	00 (00 (00	**
** STAT	ION ID: SB-01		AC MUMBED.				COLLI	ECTION START:	10/16/90	1535 STOP:	00/00/00	**
** CASE	NUMBER: 15099	, ,	AS NUMBER				MD I	NUMBER: Y139	•			**
*** * * *		* * * * *		* * * *	* * * * :							
MG/KG		ANALYTICAL				ř	MG/KG		ANALYTICA	L RESULTS		
4500	ALUMINUM						30	MANGANESE				
5.90 20J 20 10	ANTIMONY						Q. 11U	MERCURY				
<u>2</u> UJ	ARSENIC						20	NICKEL				
20	BARIUM						160U O.47UR	POTAŜSIUM SELENIUM				
0.73U	BERYLLIUM CADMIUM						1.2UJ	SILVER				
1900	CALCIUM						600	SODIUM				
7.9	CHROMIUM						0.47U	THALLIUM				
0.98U 0.73UJ	COBALT						NA	TIN				
O. 73UJ	COPPER						6 U	VANADIUM	•			
4300J	IRON						4UJ	ZINC	CTUDE			
4.3J 240	LEAD MAGNESIUM						21	PERCENT MOIS	SIUKE			
240	MAGNESIUM											

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METALS DA	ATA REPORT								
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** PRO	JECT NO. 91-025	SAMPLE	E NO. 51682	SAMPLE TYPE	GROUNDWA			COLLECTED BY: M_GORDO	
** SOUP	RCE: AMAX PHOSP	HAIE LACTE	-			CITY:	PALMETTO	ST: FL	**
** STAT	ION ID: MW-06		CAC MIMBED	4		COLLE	CTION START:	10/16/90 1615 STO	P: 00/00/00 **
	NUMBER: 15099		SAS NUMBER	:		MUN	UMBER: Y143		**
**									
*** * * *		ANAL VTICA	AL RESULTS	• • • • • •		ŪG/L T		ANALYTICAL RESULTS	
UG/L 160U	ALUMINUM	ANALTITUA	AL KESULIS			7U	MANGANESE	ANALTITUAL RESULTS	
240	ANTIMONY					Ó. 4UJ	MERCURY		
240	ARSENIC					6U	NICKEL		
20 90	BARIUM					6400	POTASSIUM		
ĬŬ	BERYLLIUM					100J	SELENIUM		
άŬ	CADMIUM					50J	SILVER		
75000	CALCIUM					29000	SODIUM		
60	CHROMIUM					TOUR	THALLIUM		
4U	COBALT					NA	TIN		
30	COPPER					30	VANADIUM		
1700	IRON					60UJ	ZINC		
8	LEAD								
22000	MAGNESIUM								

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METALS DATA REPORT		,,
** PROJECT NO. 91-025 SAMPLE NO. 51683 SAMPLE ** SOURCE: AMAX PHOSPHATE FACIL ** STATION ID: TW-01 ** CASE NUMBER: 15099 SAS NUMBER:	E TYPE: GROUNDWA PROG ELEM: NSF COLLECTED BY: M GORDON CITY: PALMETTO ST: FL	* * * * * * * * * * * * * * * * * * *
UG/L 36000 ALUMINUM 24U ANTIMONY 14 ARSENIC 110 BARIUM 2U BERYLLIUM 3U CADMIUM 91000 CALCIUM 78 CHROMIUM 7 COBALT 20U COPPER 26000J IRON 18 LEAD 20000 MAGNESIUM	UG/L 70U MANGANESE O.20U MERCURY 18 NICKEL 29000 POTASSIUM 10UJ SELENIUM 5UJ SILVER 28000 SODIUM 10UR THALLIUM NA TIN 74 VANADIUM 60UJ ZINC	* * * * * * * * * * * ***

^{***}FOOTNOTES*** *FOUTNUTES***
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METALS DA	TA REPORT					•				
*** * * *	* * * * * *	* * * * *	* * * * *	* * * * * * *	* * * * *	* * * *	* * * * * *	* * * * * * * *	* * * * * * *	* * * * * ***
** PROJ	ECT NO. 91-025	SAMPLE	NO. 51684	SAMPLE TYPE:	GROUNDWA	PROG	ELEM: NSF	COLLECTED BY: M		**
** SOUR	CE: AMAX PHOSPI	HATE FACIL				CITY:	PALMETTO	ST: F	L	**
** STAT	ION ID: PW-01					COLLE	CTION START:	10/17/90 0935	STOP: 00/00/	00 **
** CASE	NUMBER: 15099		SAS NUMBER:			MD N	CTION START: UMBER: Y147	• •		**
**										**
*** * * *	* * * * * * *	* * * * *	* * * * *	* * * * * * *	* * * * *	* * * *	* * * * * *	* * * * * * * *	* * * * * * *	* * * * * ***
UG/L		ANALYTICA	L RESULTS			UG/L		ANALYTICAL RESU	LTS	
40U	ALUMINUM				61		MANGANESE			
240 20 80	ANTIMONY					. 200	MERCURY			
20	ARSENIC				61		NICKEL			
80	BARIUM					700	POTASSIUM			
1 U 3 U	BERYLLIUM				21	IJ	SELENIUM			
30	CADMIUM				5	UJ	SILVER			
83000	CALCIUM					5000	SODIUM			
6U 4U	CHROMIUM				10	OUR	THALLIUM			
40	COBALT		•			. NA	TIN			
200	COPPER				31		VANADIUM			
<u> 3</u> อดกา	IRON				40	บบป	ZINC			
4U	LEAD									
40000	MAGNESIUM									

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METALS	DATA REPORT		_			- •				
*** *	PROJECT NO. 91-025		* * * * * * * * SAMPLE TYPE			_ • . • . • . • . •	COLLECTED BY			* * * ***
** 9	SOURCE: AMAX PHOS		SAMPLE ITPL	. 301L	CITY:	PALMETTO	· S	T: FL	00.100.100	**
** 5	STATION ID: SS-02 CASE NUMBER: 15099	SAS NUMBER	:		COLLEG MD N	CTION START: UMBER: Y144	10/17/90 0	925 STOP:	00/00/00	**
**										* * * * * * * * * * * * * * * * * * * *
MG	KG	ANALYTICAL RESULTS			MG/KG	MANGANECE	ANALYTICAL			
200 5.10	ALUMINUM ANTIMONY				9 . 10ປ	MANGANESE MERCURY				
10J 30	ARSENIC BARIUM				. 3U VQ	NICKEL POTASSIUM				
0.210	BERYLLIUM			Ō	. 42UR	SELENIUM				
0.63U 2100	CADMIUM CALCIUM				. 1UJ :0U	SILVER SODIUM				
6.8 0.84U	CHROMIUM COBALT			0	. 42U NA	THALLIUM TIN				
20UJ	COPPER				U	VANADIUM				
50J 50J	IRON LEAD				00J 7	ZINC PERCENT MOI	STURE			
50J 180	MAGNESIUM			•	-		- · - · · -			

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METALS DA	TA REPORT			_		200, 711112	110, 471.			12,01,00
*** * * * ** PROJ! ** SOUR! ** STAT	ECT NO. 91-025 CE: AMAX PHOSF ION ID: 58-02 NUMBER: 15095	PHATE FACIL	* * * * * NO. 51686 AS NUMBER:		YPE: SOIL	CITY: COLLE	E * * * * * * ELEM: NSF C PALMETTO CTION START: UMBER: Y145	COLLECTED BY: M ST: 10/17/90 0945	FL	* * * * ***
** ** * * * * MG/KG 1100 5.50 10J 30 0.230 0.690 1300 1.40 0.920 0.690J 800J 1J 30U	* * * * * * *	* * * * * * * ANALYTICAL	* * * * *		* * * * * *	* * * * * * * MG/KG 1U 0.11U 1.4U 30U 0.47UR 1.2UJ 30U 0.47U NA 1U 4UJ	MANGANESE MERCURY NICKEL POTASSIUM SELENIUM SILVER SODIUM THALLIUM TIN VANADIUM ZINC	* * * * * * * ANALYTICAL RES	* * * * * * * * * ULTS	**

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METALS DATA REP	∩PT					, ,
*** * * * * * * * * * * * * * * * * *	* * * * * * * * . 91-025 SAMPLI AX PHOSPHATE FACII	E NO. 51687 SAMPL	* * * * * * * * * E TYPE: GROUNDWA		COLLECTED BY: M GORDON ST: FL	00/00/00 **
** CASE NUMBE	Ŕ: 15099	SAS NUMBER:		MD NUMBER: Y328	· · ·.	**
750 ALUMI 30J ANTIM 30J ARSEN 120 BARIU 1U BERYLL 18 CADMI 380000 CALCI 5U CHROM 7U COBAL 3U COPPE 10000J IRON 4U LEAD 16000 MAGNE	NUM ONY IC M LIUM UM UM IUM IUM T R	* * * * * * * * * * * * * * * * * * *	066 91 53 1	UG/L 20 MANGANESE 1.20U MERCURY U NICKEL 100 POTASSIUM 5UJ SELENIUM UJ SILVER 150000 SODIUM OUR THALLIUM NA TIN	ANALYTICAL RESULTS	* * * * * * * * * * * * * * * * * * * *

REMARKS HOLDING TIME EXCEEDED-CN ***REMARKS***

FOOTNOTES

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METALS DATA REPORT		
	TYPE: SOIL PROG ELEM: NSF C CITY: PALMETTO COLLECTION START: MD NUMBER: Y150	* * * * * * * * * * * * * * * * * * *
	MG/KG 9U MANGANESE 0.19U MERCURY 4.2 NICKEL 550 POTASSIUM 3.7UR SELENIUM 1.8UJ SILVER 3900 SODIUM 0.74U THALLIUM NA TIN 24 VANADIUM 20UJ ZINC 46 PERCENT MOIS	* * * * * * * * * * * * * * * * * * *

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METALS	ATA REPORT				E1 A 10	-01011	LUD, AI	TENS, GA.		•	, 0 1, 00
*** * *	# # # # # # #			* * * *		* * * 1					* ***
** PRC	JECT NO. 91-02	5 SAMPLE	NO. 51689	SAMPLE	TYPF:	SOTI	PRO	ELEM: NSF	COLLECTED BY: M GORDON		**
	IRCE: AMAX PHOS			J EE		3012	CIT	Y: PALMETTO	ST: FL		**
** STA	TION ID: SS-03	}					COL	ECTION START	: 10/17/90 1020 STOP	: 00/00/00	**
	E NUMBER: 1509		SAS NUMBER	:			MD	NUMBER: Y148	, ,		**
**											**
*** * *		* * * * * *		* * * *.	* * *	* * * *	. * * * *	* * * * * *		* * * * * * * *	* ***
MG/K		ANALYTICA	L RESULTS				MG/KG		ANALYTICAL RESULTS		
4600	ALUMINUM						10	MANGANESE			
5.70	ANTIMONY						<u>0</u> .120	MERCURY			
200	ARSENIC BARIUM						5.6	NICKEL POTASSIUM			
30 10	BERYLLIUM						420 2.4UR	SELENIUM			
2.6	CADMIUM						1.2UJ	SILVER			
96000	CALCIUM						1800	SODIUM			
18	CHROMIUM						0.48U	THALLIUM			
211	COBALT						0.400 N/				
18 20 40J	COPPER						36	VANADIUM			
5200J	IRON						ŽÕUJ	ZINC			
9.5J	LEAD						19	PERCENT MO	ISTURE		
220	MAGNESIUM										

^{***}FOOTNOTES***

^{*}A-AVERAGE VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN

*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

METALS	ATA REPORT				E . A . W	Edion IV	LJD, AII	illias, un.				12/07/	~ L
*** * * ** PRO ** SOU ** STA	JECT NO. 91-025 RCE: AMAX PHOSE TION ID: TW-02 E NUMBER: 15099	HATE FACIL	0. 51690 S NUMBER:	* * * * SAMPLE	* * * TYPE:	* * * * GROUNDWA	CITY	* * * * * * * * * * * * * * * * * * *		ST: FL 1040 STOP	: 00/00/00		** ** ** **
*** * * UG/L 260000 24U 53 460 6 3U 21000 190 32 20U 170000J 44 9300	* * * * * * * * * * * * * * * * * * *	ANALYTICAL	* * * * * * * * * * * * * * * * * * *	• • • •	* * *		* * * * * * * UG/L* 70. 20U 89 2900 10UJ 55UJ 2200 2UR TIN 170 130J	MANGANESE MERCURY NICKEL POTASSIUM SELENIUM SILVER SODIUM THALLIUM VANADIUM ZINC	* * * * * * * ANALYTICAL		* * * * *		**

^{***}FOOTNOTES***

^{*}A-ACTUAL VALUE *NA-NOT ANALYZED *NAI-INTERFERENCES *J-ESTIMATED VALUE *N-PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL

*K-ACTUAL VALUE IS KNOWN TO BE LESS THAN VALUE GIVEN *L-ACTUAL VALUE IS KNOWN TO BE GREATER THAN VALUE GIVEN

*U-MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT.

*R-QC INDICATES THAT DATA UNUSABLE. COMPOUND MAY OR MAY NOT BE PRESENT. RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION.

U. S. ENVIRONMENTAL PROTECTION AGENCY REGION IV, ATHENS, GEORGIA

MEMORANDUM

DATE:

NOV 05 1990

SUBJECT:

Screening Site Inspection Study Plan, Phase

AMAX Phosphate, Palmetto, Manatee County, Fl

ESD Project No. 91E-009

FROM:

Roger E. Carlton, Environmental Engineer

Hazardous Waste Section

Environmental Compliance Branch Environmental Services Division

TO:

Al Hanke, Chief

Site Assessment Section Waste Programs Branch Waste Management Division

THRU:

William R. Bokey, Chief

Hazardous Waste Section

Environmental Compliance Branch Environmental Services Division

willing Bold

SISB/SAS

ATLANTA, GA.

The Screening Site Inspection Study Plan, Phase II, AMAX Phosphate, Palmetto, Manatee County, Florida, has been reviewed and is complete as is.

If you have any questions, please contact me at (404) 546-3351 or (FTS) 250-3351.

cc: Finger/Wright Bokey/Hall

Knight Franklin



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

ENVIRONMENTAL SERVICES DIVISION ATHENS, GEORGIA 30613

SISB/SAS

atlanta, ga

MEMORANDUM

DATE:

October 3, 1990

SUBJECT:

Screening Site Inspection Study Plans

FROM:

Pat Stamp Pat stans

Laboratory Quality Control Specialist

Laboratory Evaluation & Quality Assurance Section

TO:

Al Hanke, Chief

Site Assessment Section Waste Programs Branch Waste Management Division

THRU:

Wade Knight, Chief W

Laboratory Evaluation & Quality Assurance Section

We have reviewed the following subject documents and have no comments:

- 1. Reliable Metal Products, Geneva, Alabama
- 2. AMAX Phosphate, Palmetto, Florida
- Georgia Power/Plant Branch, Milledgeville, Georgia
- 4. Buncombe County Landfill, Asheville, North Carolina
- 5. 3M Greenville Plant, Greenville, South Carolina
- 6. Columbia Landfill, Columbia, South Carolina
- 7. Dart Industries, Hemingway, South Carolina
- 8. Duracell International Battery, Lancaster, South Carolina
- 9. G.B. Fermentation, Kingstree, South Carolina
- 10. Old Lyman Dump, Lyman, South Carolina
- 11. Old Startex, Spartanburg County Landfill, Startex, SC
- 12. Richland County Landfill, Columbia, South Carolina
- 13. Slater Plant Property, Slater, South Carolina



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

SEP 2 1 1990

4WD-WPB

345 COURTLAND STREET ATLANTA, GEORGIA 30365

CERTIFIED MAIL
RETURN RECEIPT REQUEST

Mr. Ivan Nance Royster Phosphates, Inc. 13300 US Hwy 41 North Palmetto, Florida 34221

Re: Amax Phosphate - FLD043055151 US Hwy 41 North Palmetto, Manatee County, Florida

Dear Mr. Nance:

The United States Environmental Protection Agency (EPA), pursuant to the authority and requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), 42 U.S.C. 9601 et seq., as amended by the Superfund Amendments and Reauthorization Act (SARA), Public Law 99-499, is planning to conduct an investigation of the above referenced site. EPA has reason to believe that there may be a release or threat of a release of hazardous substances from the site into the surrounding environment. The purpose of the investigation is to determine the nature and extent of contamination at the site and to determine what, if any, further response action would be appropriate.

As per the telephone conversation on September 19, 1990, with you, EPA was granted permission for access to your property beginning on or about October 15, 1990, and continuing through the completion of the investigation on or about October 19, 1990. Activities which maybe conducted during the investigation include:

- 1. Inspect, sketch and photograph the premises;
- 2. Collect surface and subsurface soil samples;
- 3. Collect groundwater and subsurface water samples;
- 4. Collect sediment samples;
- Conduct air monitoring;

6. Transportation of equipment onto and about the site as necessary to accomplish the activities above, including trucks and sampling equipment.

The above sampling activity will be conducted by personnel from EPA Region IV's Field Investigation Team (FIT). Dr. Maureen Gordon of FIT will contact you prior to the actual site visit to make final arrangements and note any changes.

Split samples will be made available if requested. However, you will be required to furnish your own containers as well as your own laboratory analyses.

If you have any questions, please contact me at (404) 347-5065. Your cooperation in this matter is appreciated.

Sincerely,

Dorothy L. Rayfield Florida Project Officer

Enclosure

cc: Eric Nuzie, FDER

K.D. Pass, NUS Corporation

4WD-SAS 4WD-SAS

RAYFIELD VILLAMARZO

DR:AA:DOC ACCESS1/2/3:09/20/90:5065

YELLOW



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET, N.E. ATLANTA, GEORGIA 30365

4WD-WPB

Bob Gregor Site Manager B&V Waste Science and Technology Corporation 1117 Perimeter Center West Suite W-212 Atlanta, Georgia 30338

RE: Amax Phosphate Facility

Palmetto, Manatee County, Florida

EPA ID No. FLD043055151

Site Inspection Prioritization

Dear Mr. Gregor:

We have received the Site Inspection Prioritization on Amax Phosphate Facility and have completed a review of the report.

Please find the review comments on the following page.

If you have any questions concerning the review, please do not hesitate to call.

Sincerely yours,

Cynthia K. Gurley

Site Assessment Manager

South Unit

cc: Hubert Wieland, BVWST

AMAX PHOSPHATE FACILITY

REVIEW COMMENTS:

On Figure 2, please write in (Ammonia Removal Pond) beside Treatment Modification. The pond is referred to in the report but not shown on the figures.

Reference 8. Please replace this reference with a better copy. A portion of the page is cut off.

Sign and date References 20 and 21.

Please locate the site on Reference 23.

Address the above comments and finalize this report. Please send 4 complete copies.

FIT Project Manager: Fix Region on Overland FIT State Coordinator: KD Pass

EPA Contact: Downly Rhy field

Field Date: 11 Peck, of oxf 15 196

SISB/SAS

EPA ID #:

Site Name:

Site Address:

FLD043055151 TDD Number:

	File Information	Verification
Facility Owner/Operator Address Phone No. Principal Contact	Royster Phosphides Inc 13300 US Hwy 41 North Palmetto, F1. 34221 Ivan Nance, Env. (813)722-4555	1_
Landowner Address Phone No. Principal Contact (if different from above)	·	
Date of Information		

ACCESS INFORMATION SHEET

Date Access Required (3 weeks prior to field date)	 Date Information Submitted to EPA	

Comments:

U.S. ENVIRONMENTAL PROTECTION AGENCY OFFICE OF EMERGENCY AND REMEDIAL RESPONSE C E R C L I S V 1.2

PAGE: 97
RUN DATE: 03/25/87
RUN TIME: 11:40:14

M.2 - ALIAS/ALIAS LOCATION MAINTENANCE FORM

			*	ACTION: _	
SITE:	AMAX PHOSPHATE FACILITY				
EPA ID:	FLD043055151	ALIAS SEQ NO: 01			
ALIAS NAME:	BORDEN PINEY POINT PHOSPHOR	RIC SOURCE: R	*		
ALIÁS LOCATI	ION	·	*	ACTION: _	
CONTIGUOUS F	PORTION OF SITE? C	FED FAC IND: N	*	_	•
STREET : F	O BOX 908	CONG DIST : 10	*		
CITY : F	PALMETTO	ST: FL ZIP: 33561	* .	. <u></u>	
CNTY NAME: 1	IANATEE	CNTY CODE: 081	•		
LATITUDE : 2	27/31/18.0	LONGITUDE : 082/34/18.0	*	_/_/	_/
LL-SOURCE: 0	3	LL-ACCURACY:	*	<u> </u>	
SMSA : 1	140	HYDRO UNIT: 03100202	*	·	
ALIAS DESCRI	PTION:			• •	
*				_ •	
*		·		, , , , , , , , , , , , , , , , , , ,	
*				*	

U.S. ENVIRONMENTAL PROTECTION AGENCY OFFICE OF EMERGENCY AND REMEDIAL RESPONSE C E R C L I S V 1.2

PAGE: 96
RUN DATE: 03/25/87
RUN TIME: 11:40:14

M.2 - SITE MAINTENANCE FORM

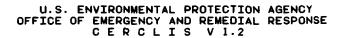
		•	ACTION: _			
EPA ID : FLD043055151						
SITE NAME: AMAX PHOSPHATE	FACILITY	SOURCE: S *	·			_
STREET : US HWY 41 NORTH		CONG DIST: 10	·			
CITY : PALMETTO	71	P: 33561 ^	·	 -		
NTY NAME: MANATEE	40	TY CODE : 081 .	·			 .
LATITUDE : 27/31/18.0	LONGITUDE	: 082/34/18.0 *	/			/
LL-SOURCE: R	L	L-ACCURACY:	_			-
SMSA : 1140	HYDRO L	NIT: 03100202 *	·			
INVENTORY IND: Y REMEDIAL	IND: Y REMOVAL IND: N F	ED FAC IND: N *	· _	-	<u>-</u>	_
NPL IND: N NPL LISTING	DATE: NPL DELISTIN	G DATE:	` <u>-</u>	<u>_</u> /	/	
SITE/SPILL IDS:		•	·	<u> </u>		
RPM NAME:	RPM PHONE:	*	· · <u></u>			
SITE CLASSIFICATION:	SITE	APPROACH:				
DIOXIN TIER:	REG FLD1:	REG FLD2: *	· 	•		_
RESP TERM: PENDING ()	NO FURTHER ACTION ()		PENDING (_	_)	NO FURTHER	ACTION (_)
ENF DISP: NO VIABLE RESP ENFORCED RESPO		RESPONSE ()	<u>=</u>	- -		
SITE DESCRIPTION:						
		e Second				

U.S. ENVIRONMENTAL PROTECTION AGENCY OFFICE OF EMERGENCY AND REMEDIAL RESPONSE C E R C L I S V 1.2

PAGE: 98
RUN DATE: 03/25/87
RUN TIME: 11:40:14

M. 2 - PROGRAM MAINTENANCE FORM

		ē.		*	ACTION:	_			
SITE:	AMAX PHOSPHATE	FACILITY							
EPA ID:	FLD043055151	PROGRAM CODE: HO1	PROGRAM TYPE:	*					_
PROGRAM	QUALIFIER:	ALIAS LINK :		*			_		
PROGRAM	NAME: SITE	EVALUATION							
DESCRIPT	ION:								
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				•		· · · · · · · · · · · · · · · · · · ·		 	
				*					
. •				•					



PAGE: 99
RUN DATE: 03/25/87
RUN TIME: 11:40:14

M.2 - EVENT MAINTENANCE FORM

	·	•	* ACTION: _		
SITE: AMAX PROGRAM: SITE	PHOSPHATE FACILITY EVALUATION				
EPA ID: FLD04	3055151 PROGRAM CODE: H01	EVENT TYPE: DS1			
FMS CODE:	EVENT QUALIFIER :	EVENT LEAD: E	* _		
EVENT NAME:	DISCOVERY	STATUS:	*		· -
ESCRIPTION:					
			*		
			*	<u> </u>	
			•		
			*	·	
ORIGINAL	CURRENT	ACTUAL			
START:	START:	START:	* _/_/_	_/_/_	_/_/_
COMP :	COMP :	COMP : 10/01/79	* <u>//</u>	_/_/_	_/_/_
HQ COMMENT:			•	,	·
He COMMENT.			*		•
RG COMMENT:					
			*		
					· · · · · · · · · · · · · · · · · · ·
COOP AGR #	AMENDMENT # STATUS	STATE %			
	•	0	*		

U.S. ENVIRONMENTAL PROTECTION AGENCY OFFICE OF EMERGENCY AND REMEDIAL RESPONSE CERCLIS V 1.2

PAGE: 100 RUN DATE: 03/25/87 RUN TIME: 11:40:14

M.2 - EVENT MAINTENANCE FORM

			* ACTION: _	•	
SITE: AMAX PROGRAM: SITE	PHOSPHATE FACILITY EVALUATION				
EPA ID: FLD04	3055151 PROGRAM CODE: H01	EVENT TYPE: PA1	•		
FMS CODE:	EVENT QUALIFIER :	EVENT LEAD:	* _		_ *
EVENT NAME:	PRELIMINARY ASSESSMENT	STATUS:	•		_
ESCRIPTION:			•		
			*		
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	OURDENE				
ORIGINAL	CURRENT	ACTUAL			
START:	START:	START:	* _/_/_	_/_/_	_/_/_
COMP :	COMP :	COMP : 03/01/80	· _/_/_	_/_/_	_/_/_
HQ COMMENT:					
	•		*		
RG COMMENT:					
J			Α	· · · · · · · · · · · · · · · · · · ·	<u> </u>
COOP AGR #	AMENDMENT # STATUS	STATE %		•	
		0	·		
				•	

9	F	ΣΔ
	L.,	

POTENTIAL HAZARDOUS WASTE SITE LOG

SITE NUMBER

480 FCK

NOTE: The initial identification of a potential size or incident should not be interpreted as a finding of illegal activity or confirmation that an actual health or environmental threat exists. All identified sites will be assessed under the EPA's Hazardous Waste Site Enforcement and Response System to determine if a hazardous waste problem actually exists.

PALMETTO /	14 US.4		FL				561	
SUMMARY OF POTENTIAL OR KNOWN PROBLEM LEN ON SITE, DISPOSAL THRU 1978 IS 10,4508 IN RIAM S. PITS, D.	:1966-1 00 Toi envas,1	979,1A NS. A LA6Œ	cid s	elus, PEAT	HEAV' 'MEN	0F N Y + TR. T + RE	ASTE ALE M YYLL	5 11
ITEM	DATE OF DETERMIN- ATION OR COMPLE- TION	RESPONSIB	BLE ORGANI INDIVIDUAL e, Contractor	L	E	SON MAKING ENTRY LOG FORM	S EN	N
1. IDENTIFICATION OF POTENTIAL PROBLEM	11-1-79	ECKHAR	RDT		FERR!	AZZUOL	0 11	j
2. PRELIMINARY ASSESSMENT	3/1/80	FLAFK	?, Clo	nk	Fer	razzui	16 3	:/:
APPARENT SERIOUSNESS OF PROBLEM:	HIGH	MEDIUM	[] LOW	w []] ног	яв. (Д)	INKNOWN		
3. SITE INSPECTION								
4. EPA TENTATIVE DISPOSITION (check appropriate Item(a) helow)								_
a, NO ACTION NEEDED	7万万				_			-
[] b. INVESTIGATIVE ACTION NEEDED								
c. REMEDIAL ACTION NEEDED								
[] J. ENFORCEMENT ACTION NEEDED								
5. EPA FINAL STRATEGY DETERMINATION (check appropriate Hem(a) helow)								_
NO ACTION NEEDED			is the bown delines			<u>.</u>		
[] b. REMEDIAL ACTION NEEDED			-		<u> </u>			_
C. REMEDIAL ACTION NEEDED BUT.								
d. ENFORCEMENT ACTION NEEDED								-
[] (1) CASE DEVELOPMENT PLAN PREPARED	D STATE OF			•		-		
(2) ENFORCEMENT CASE FILED OR ADMINISTRATIVE ORDER ISSUED								-

EPA Form T2070-1 (10-79)

Co	ntinued From Front			11.0	51440467777		A. 4126 A. 421111111			
In	dicate the major site		tivity(ies) and				OF SITE ACTIVITY		ropriete hoves	
×	A. TRANSPOR		lx1		STORER	×	C. TREATER		· X ·	DISPOSER
T	1. RAIL		I. Pit			٦,	. PIL TBATION		I. LANDFI	
	2. ВНІР		2. 501	HFACI	MPOUNDMENT	7	INCINERATION		2. LANDFA	RM
	3. BARGE		3. DR	UMS		3	. VOLUME REDUCTI	ON	. D. OPEN DI	UMP
	4. TRUCK		4. TA	NK, A	OVE GROUND		. RECYCLING/RECO	VERY	4. SURFAC	E IMPOUNDMENT
	S. PIPELINE		5. TA	NK. 8	LOW GROUND		. CHEM./PHYS. TRE	ATMENT	S. MIDNIGH	T DUMPING
	6. OTHER (epecily):		6. OT	HER (pecify):	- (. BIOLOGICAL TREA	TMENT	6. INCINER	ATION
			İ	•	·	7	. WASTE OIL REPRO	CESSING	7. UNDERG	ROUND INJECTION
1]	_ •	SOLVENT RECOVE	RY	D. OTHER	(epecity):
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 	SPECIFY DETAILS	0.	SITE ACTIVITIES	LASN			 		L	
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 -			 -		V. WASTE RELAT	FD	INFORMATION			······································
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٦	10. OTHER (apecif	٠.			. •				•	
_	WASTE CATEGORIE		(C	***						
	. Are records of wast		vailable? Specify	y items	such se menifeste, i	n v e n	tories, etc. below.			•
	' ·						1			
-	Estimate the amou	unt	(specify unit of	meası	re)of weste by cat		y; mark 'X' to indic	ate which	wester are o	resent.
	. SLUDGE		b. OIL	1	c. SOLVENTS	Ť	d. CHEMICALS		SOLIDS	1. OTHER
AN	OUNT	AM	OUNT	AI	MOUNT	AN	AOUNT	AMOUNT		AMOUNT
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5	NIT OF MEASURE	UZ	T OF MEASURE	U	NIT OF MEASURE	Ü	IT OF MEASURE	UNIT OF	MEASURE	UNIT OF MEASURE
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'X'	(1) PAINT, PIGMENTS	X.	(1) OIL Y	×	(1) HALOGENATED	'X	111 A CIDS	'X(1) FL	YASH '	(I) PHARMACEUT.
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	(2) METALS SLUDGES	┡	(8) O THER (4P4c)	(y):	(2) NON-HALOGNTE	٠ŧ	(2) PICKLING	(2) A.S	BE#TQ#	(Z) HOSPITAL
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	(3) PQTW				ISI OTHER (epecity):	1	(a) CAUSTICS	(2) MI	LLING/ NE TAILINGS	(a) RADIOACTIVE
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	(4) A LUMINUM SLUDGE		•			1	(4) PESTICIDES	(4) F E	RROUS LTG. WASTES	(4) MUNICIPAL
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	OTENTIAL HAZARDOUS ICATION AND PRELIMI			TV TV	SIYE NUMBER (to be gone a signed by Hg)
NOTE: This form is completed for ex submitted on this form is based on av and on-site inspections.	ich potential hazardous was allable records and may be	te site to help a updated on subs	set priorities for sequent forms as	eite inspe a result o	ction. The information of additional inquiries
GENERAL INSTRUCTIONS: Complet Assessment). File this form in the R Agency; Site Tracking System; Hazer	te Sections I and III through egional Hazardous Vaste L dous Vaste Enforcement To	X as complete og File end sub isk Force (EN-3	tly as possible be mit a copy to: U. 35); 401 M St., S	fore Sect S. Enviro V; Washi	ion II (Preliminery nmental Protection ngton, DC 20460.
	I. SITE IDE	TIFICATION			
PineyPoint Phosph	ate Product	US 41	P.O.	Box	790
G. OWNER OPERATOR (IL MODER)	Imetto	Fla	33540	177	anatee
1. NAME	Plant Manager	· (Boro	Jen, Inc)	813	PHONE NUMBER 722-4555
1. FEDERAL 2. STATE	3. COUNTY 4 MUNIC	PAL X5 P	RIVATE -6	INKHOWN	
I. SITE DESCRIPTION					
J. HOW IDENTIFIED (I.e., citizen's comp	ainte, OSHA citetione, etc.)				K. DATE IDENTIFIED
Fokhandt Ron	nrt #480	•			Oct 1979
L. PRINCIPAL STATE CONTACT	711				1001 1.77
Robert H	aufield			904	488-0308
	PRELIMINARY ASSESSME	NT (complete th	is section last)	· 7	
A. APPARENT SERIOUSNESS OF PROBLE	<u>. </u>	B. UP	чкноми		
B. RECOMMENDATION			:		
1. NO ACTION NEEDED (no heard)		2. IMMEDI 8. TENT	ATE SITE INSPEC AT VELY SCHEOL	TION NEE	DED
3. SITE INSPECTION NEEDED . TENTATIVELY SCHEDULED P	OR:	b. WILL	BE PERFORMED	BY:	
b. WILL BE PERFORMED BY:	···········		SPECTION NEEDI	ED (low pri	lority)
Pending further	EPA/DEI	R Stude	4		
C. PREPARER INFORMATION	"lask"	8/3/	HONE NUMBER 1985 - 74	187	3. DATE (MO., doy, & yr.)
10061	III. SITE IN	FORMATION	705 7 7	oc_	75/00
A. SITE STATUS 1. ACTIVE (These industrial or municipal sites which are being used for waste treatment, storage, or disposal on a continuing beals, even if intra- quently.)	2. INACTIVE (Those eltes which no longer receive mester).	3. OTHER (Those sites the ne regular or con	at include such inc	idente like elte for w	''midnight dumping'' where eate disposal has occurred.)
B. IS GENERATOR ON SITE?	2 YES (specify gene	rator's low-digit	sic code): 2 8	374	
C. AREA OF SITE (In edire)	D. IF APPARENT SERIOUSN		IGH, SPECIFY CO		
E. ARE THERE BUILDINGS ON THE SIT	R)				

T2070-2 (10-79)

Continue On Reverse

				
Continued From Page 2				
3. LIST SUBSTANCES OF GREATES			TED INFORMATION BE ON THE SITE (F	
4. ADDITIONAL COMMENTS OR NA	RRATIVE DE	SCRIPTION O	F SITUATION KNO	WN OR REPORTED TO EXIST AT THE SITE.
		VI. HAZ	ARD DESCRIPTI	ОН
A. TYPE OF HAZARD	B. POTEN- TIAL HAZARD (mark 'X')	C. ALLEGED INCIDENT (mark 'X')	D. DATE OF INCIDENT (mo.,day,yr.)	E, REMARKS
1. NO HAZARD		19000000	7 7 2 2 Y	THE RESIDENCE OF THE PARTY OF T
2. HUMAN HEALTH				
S. NON-WORKER INJURY/EXPOSURE				
4. WORKER INJURY				
S. OF WATER SUPPLY				
6. CONTAMINATION 6. OF FOOD CHAIN				
7. CONTAMINATION OF GROUND WATER				
S. CONTAMINATION OF SURFACE WATER				
9. DAMAGE TO FLORA/FAUNA	<u> </u>			
10. РІВН КІЦЦ				
11. CONTAMINATION OF AIR		ļ		
12. NOTICEABLE ODORS	ļ			
18. CONTAMINATION OF BOIL			<u> </u>	
14. PROPERTY DAMAGE				
15. FIRE OR EXPLOSION				
18. SPILLS/LEAKING CONTAINERS/ RUNOFF/STANDING LIQUIDS				
17. DRAIN PROBLEMS				
18. EROSION PROBLEMS	ļ	<u> </u>		
19. INADEQUATE SECURITY		-		
	1	1	1	1

Continued From Front				
			VII. PERMIT INFO	RMATION
A. INDICATE ALL APPLI	CABLE PER	MITS HELD BY T	HE SITE.	
1. NPDES PERMIT	2 SPC	C PLAN	3. STATE PERMIT	(apocity):
4. AIR PERMITS	5. LOC	AL PERMIT	6. RCRA TRANSPO	RTER
7 RCRA STORER	6. RCF	A TREATER	9 RCRA DISPOSER	·
10. OTHER (apocity)	:			
B. IN COMPLIANCE?				
1. YES	2. NO] 3. инкножн	
4. WITH RESPECT 1	O (liet regul	elion neme & numb	er):	
		VIII.	PAST REGULATO	RY ACTIONS
A. HONE	☐ B. Y€	\$ (summarize belo	₩)	
		IV INCO	CTION ACTIVITY	(224 - 2 - 42i-4)
		IA. INSPE	CTION ACTIVITY	(past or on-going)
A NONE	B. YES	(complete items)	,2,3, & 4 below)	
1. TYPE OF ACTIV	//TY	2 DATE OF PAST ACTION (mo., day, & yr.)	PERFORMED BY: (EPA/State)	4. DESCRIPTION
	·			
		X. RE	MEDIAL ACTIVITY	(past or on-going)
<u></u>	· · · · · · ·		•	
A. NONE	B. YE	(complete items)		
1. TYPE OF ACTIV	VIT Y	2. DATE OF PAST ACTION (mp., day, & yr.)	8. PERFORMED BY: (EPA/State)	4. DESCRIPTION
		,		
		***************************************		-
		on in Sections I		out the Preliminary Assessment (Section II)

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U.S. EPA REGION IV

SDMS

Unscannable Material Target Sheet

OocID:	10079029	Site ID:	F1204305515,	/
Site Name:	Hew &	SiTU		
				
				·
Nature of M	aterial:			
Мар:	$\sqrt{}$		Computer Disks:	
Photos:			CD-ROM:	
Blueprints	:		Oversized Report:	
Slides:			Log Book:	
Other (des	cribe):	·		
	f material:			